PB-229 714

CONFERENCE IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE MONONGAHELA RIVER AND ITS TRIBUTARIES. VOLUME III. HELD AT PITTSBURGH, PENNSYLVANIA ON DECEMBER 17, 1963

Public Health Service
Washington, D.C.

17 December 1963

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in the matter of

Pollution of the Interstate Waters of the

MONONGAHELA RIVER AND ITS TRIBUTARIES

Volume III

December 17, 1963
Pittsburgh, Pennsylvania

U.S. Department of Health, Education, and Welfare
Washington, D.C.

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CONFERENCE

in the matter of

Pollution of the Interstate Waters of the

MONONGAHELA RIVER AND ITS TRIBUTARIES

Volume III

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U.S. Department of Health, Education, and Welfare
Washington, D.C.

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report includes data on [illegible] and [illegible]

Conference in the Matter of Pollution of the Interstate Waters of the Monongahela River and Its Tributaries (Maryland-West Virginia-Pennsylvania), convened at 9:30 a.m., Wednesday, December 18, 1963, at the Pittsburgh-Hilton Hotel, Pittsburgh, Pennsylvania.

PRESIDING:

Mr. Murray Stein, Chief, Enforcement Branch, Water Supply and Pollution Control, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.

OTHERS PRESENT:

(As heretofore noted.)

PROCEEDINGS

MR. STEIN: May we reconvene?

At this point we would like to call on the United States Department of Health, Education, and Welfare for its presentation.

Mr. Anderson.

STATEMENT OF E. J. ANDERSON, REGIONAL PROGRAM DIRECTOR FOR WATER SUPPLY AND POLLUTION CONTROL, REGION II, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, NEW YORK, NEW YORK

MR. ANDERSON: Thank you, Mr. Stein.

I am Earl Anderson, Regional Program Director for Water Supply and Pollution Control, Region II, of the Department of Health, Education, and Welfare, with offices in New York City.

This office serves the four States of New York, New Jersey, Delaware and Pennsylvania. The other States represented here, namely, West Virginia and Maryland, are served from our Region III office at Charlottesville, Virginia. Mr. Gebhart, the Regional Program Director in that office, is here, and I would like to take a moment to introduce him.

Mr. Gebhart, will you stand, please, so the folks can see who you are? Thank you.

Perhaps I should also introduce two people whose names appear on the front of our report, Mr. Kittrell, in charge of our Pollution Evaluation Unit, and Mr. Mackenthun, our Biologist.

Mr. Kittrell, would you stand, please? He hasn't come in yet this morning.

Mr. Mackenthun, would you stand? Thank you.

Before calling on Mr. Sidio to present the statement for the Department, I would like to say that his report, which has been distributed here, is a presentation of information on current water quality conditions in the interstate section of the Monongahela River and its tributaries, approximately down to the Allegheny County line.

This report was prepared and distributed to the conferees several weeks before the conference. It was the only statement presented at this conference which was made available to all the conferees prior to the conference.

After Mr. Sidio's presentation, I will call on two representatives from the Department of the Interior, to present statements on behalf of the Bureau of Mines and the Bureau of Sports Fisheries and Wildlife.

E. J. Anderson

Now, Mr. Chairman, I will call on Mr. Sidio, the Public Health Engineer with our Pollution Evaluation Unit at the Taft Sanitary Engineering Center at Cincinnati, to present our statement.

Mr. Sidio.

A. D. SIDIO

STATEMENT OF A. D. SIDIO, PUBLIC HEALTH ENGINEER, POLLUTION EVALUATION UNIT, UNITED STATES DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, ROBERT A. TAFT SANITARY ENGINEERING CENTER, CINCINNATI, OHIO

MR. SIDIO: Thank you, Mr. Anderson.

My name is A. D. Sidio, Public Health Engineer, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.

Mr. Chairman, my statement will be abstracted from the report which has been made available. I would request that the entire report, including charts, tables and appendices, be made part of the record.

INTRODUCTION

On August 7, 1963, the Secretary of the Department of Health, Education, and Welfare notified the States of Pennsylvania, West Virginia and Maryland that a conference was to be held in Pittsburgh, Pennsylvania, on December 17 and 18, 1963, to consider the matter of the pollution of the interstate waters of the Monongahela River and its tributaries. The action was taken in accordance with Section 8 (c) (1), Federal Water Pollution Control Act, on the basis of reports that gave the Secretary reason to believe that pollution of the Monongahela River and its tributaries, originating in West Virginia and Maryland, was endangering the health or welfare of persons in Pennsylvania.

From August 14 through September 6, chemical, bacteriological and physical studies were made of the Monongahela River System. From September 9 through 20, biological studies of the river system were conducted.

This report has been prepared on the results of the studies conducted during August and September, 1963. Additional information for the report was obtained from a U. S. Public Health Service Report prepared in 1943, and from various other reports and data made available by the pollution control agencies of the States of Pennsylvania, West Virginia and Maryland, and the Ohio River Valley Water Sanitation Commission. The States of Pennsylvania and West Virginia are member States of ORSANCO.

THE AREA

The Monongahela River is formed by the confluence of the West Fork and Tygart Rivers at Fairmont, West Virginia.

A. D. Sidio

The drainage basin includes the southwest corner of Pennsylvania, the northeast portion of West Virginia, and a small section of western Maryland. The basin drains an area of 7,380 square miles. The river flows in a notherly direction and joins the Allegheny at Pittsburgh to form the Ohio River. The mainstem of the Monongahela River flows through the Appalachian Plateau region and is characterized by rugged topography, with narrow stream valleys several hundred feet below the level of the uplands.

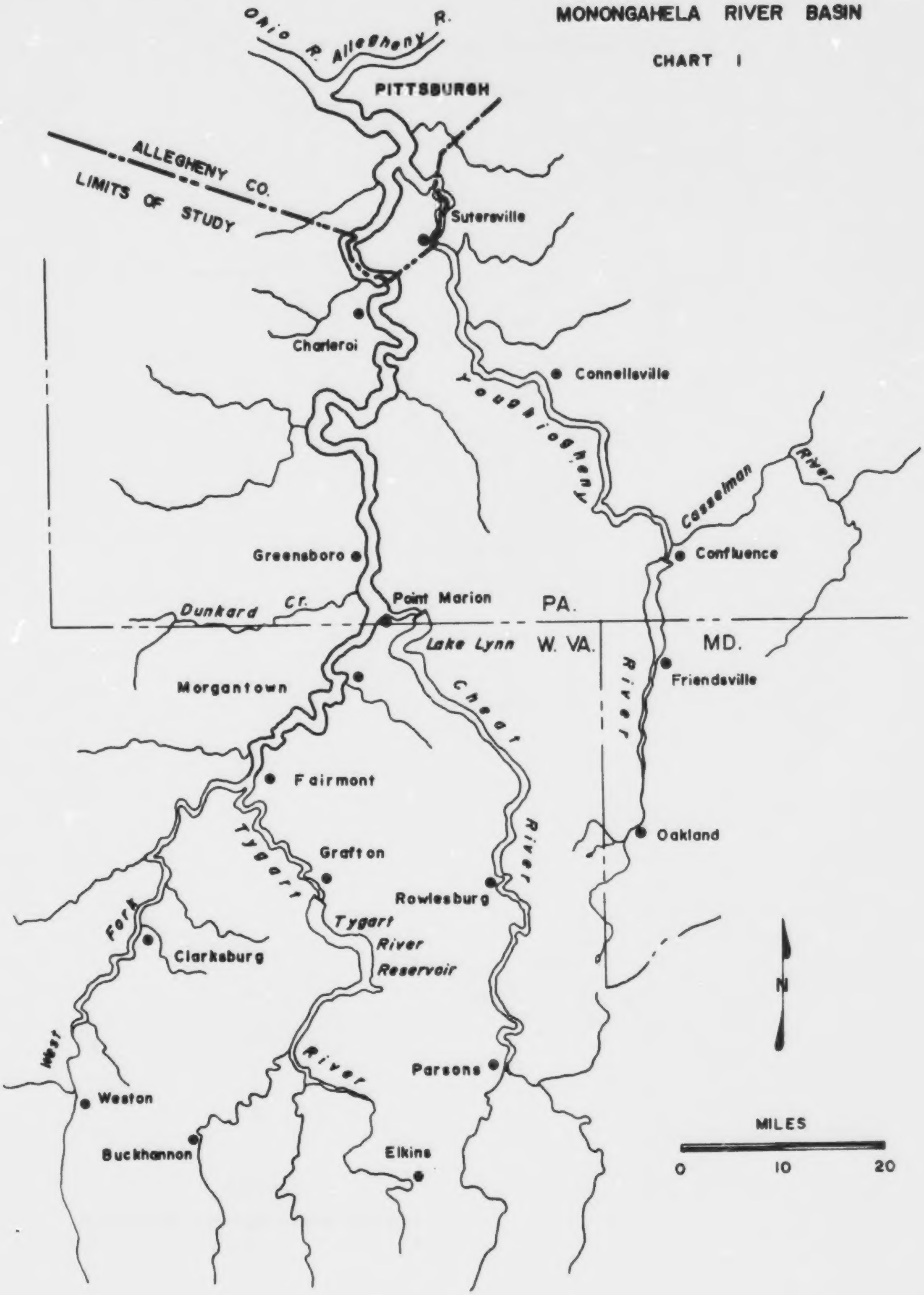
Major tributaries of the Monongahela are the Youghiogheny, Cheat, West Fork and Tygart Rivers.

The section of the Monongahela of concern in this report extends downstream to Charleroi, Pennsylvania. The section of the Youghiogheny involved extends down to Sutersville, Pennsylvania. These sections are shown in Charts 1 and 1A.

(Charts 1 and 1A are as follows:)

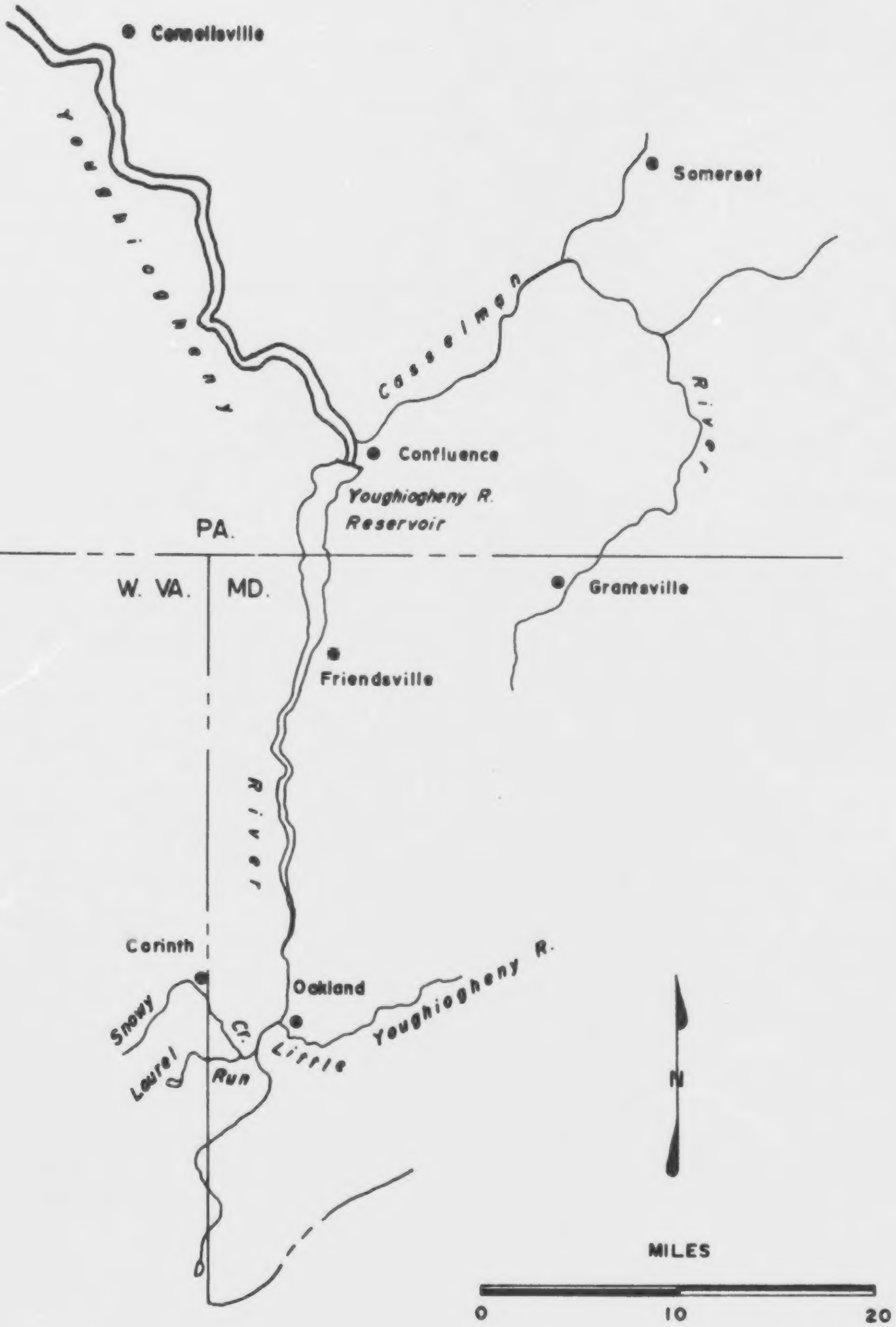
MONONGAHELA RIVER BASIN

CHART 1


Ohio R.
Allegheny R.
PITTSBURGH
ALLEGHENY CO.
LIMITS OF STUDY
Sutersville
Charleroi
Connellsville
Youghiogheny
Casselman
River
Confluence
Greensboro
Point Marion
Dunkard Cr.
PA.
Lake Lynn
W. VA.
MD.
Friendsville
River
Morgantown
Cheat
Fairmont
Tygart
Grafton
Rowlesburg
River
Oakland
Tygart
River
Reservoir
Fork
Clarksburg
N
West
River
Parsons
Weston
Buckhannon
Elkins
MILES
0
10
20

YOUGHIOGHENY RIVER SUB BASIN

CHART 1A


Connellsville
Youghiogheny
Somerset
Casselman
River
Confluence
Youghiogheny R.
Reservoir
PA.
W. VA.
MD.
Grantsville
Friendsville
River
Corinth
Oakland
Youghiogheny R.
Snowy
Cr.
Little
Laurel
Run
N
MILES
0
10
20

A. D. Sidio

This chart shows the mainstem of the Monongahela from Fairmont, the two major tributaries, the Tygart and West Fork, forming the Monongahela at Fairmont, and the Monongahela going down to the vicinity of the Allegheny County line.

That is where our last sampling station was, at Charleroi. This is the Cheat River, which also is an interstate stream. This is Dunkard Creek, which is interstate.

This is the upper Youghiogheny, which is interstate between West Virginia and Maryland, Laurel Run and Snowy Creek at Youghiogheny, interstate between Maryland and Pennsylvania.

Several stream reaches in the basin are of interstate concern. The main stem of the Monongahela is interstate as it flows from West Virginia into the State of Pennsylvania at River Mile 91.25. The Cheat River is interstate between West Virginia and Pennsylvania, just upstream of its confluence with the Monongahela. Dunkard Creek, tributary to the Monongahela just below the West Virginia-Pennsylvania State line, crosses the State line at several points. The Youghiogheny River is interstate as it flows from West Virginia into Maryland, and again as it flows from Maryland into Pennsylvania. Casselman River, tributary to the Youghiogheny, is interstate between Maryland and Pennsylvania. Laurel Run and Snowy Creek, tributaries to the Youghiogheny headwaters, are interstate between West Virginia and Maryland. Numerous other small streams in the basin are interstate, but little interstate pollution in these small streams was indicated by preliminary investigations.

The drainage area of the Monongahela upstream from Charleroi is 5,213 square miles, and that of the Youghiogheny above Sutersville is 1,715 square miles.

Four reservoirs are presently in operation in the Monongahela Basin. These are Lake Lynn on the Cheat, Deep Creek Reservoir on Deep Creek, tributary to the Youghiogheny, Tygart Reservoir on the Tygart Valley River, and the Youghiogheny Reservoir on the Youghiogheny. The four reservoirs provide approximately 700,000 acre feet of storage. Lake Lynn and Deep Creek Reservoirs are operated to produce peak-load power. The Tygart and Youghiogheny reservoirs are operated to provide low flow control.

The main stem of the Monongahela River is canalized for its entire length by 14 low lift locks and dams. Navigation depths of 8 feet are provided in the lower 90 miles, and 7 feet in the upper 38 miles.

SOURCES OF DATA

A. D. Sidio

Current information for this report was obtained through a study of the chemical, biological, bacteriological, and physical conditions of the Monongahela River system during the latter part of August and September, 1963.

Valuable information and data also were obtained from the 1943 United States Public Health Service Ohio River Pollution Report (House Document No. 266, 78th Congress, August 27, 1943).

Additional data were available in the Ohio River Valley Water Sanitation Commission Report Monongahela River - Sewage Treatment Considerations ; the Pennsylvania Department of Health, Division of Sanitary Engineering's "Report to the Sanitary Water Board on the Classification of the Main Stem of the Monongahela River"; the West Virginia Water Resources Commission's "Report on the Acid Mine Water Problem in the Snowy Creek-Laurel Run Area"; and several survey reports, along with field data made available by the Maryland Water Pollution Control Commission.

Sampling stations used during the August and September, 1963 study are listed in Table 1. The station locations are indicated on Chart 2.

(Table 1 and Chart 2 are as follows:)

MONONGAHELA RIVER SYSTEM

STATION DESCRIPTIONS

TABLE NO. 1

STATION	RIVER MILE	DESCRIPTION
M-1	M- 41.4	Monongahela River near Charleroi, Pa. Station is located at Lock 4 on right river bank.
M-2A	M- 65.3	Monongahela River at the Millsboro, Pa. Water Treatment Plant.
M-2B	M- 70.6	Monongahela River at the Crucible Ferry Crossing near Crucible, Pa.
M-3	M- 85.0	Monongahela River near Greensboro, Pa. Station is located on land wall of Lock 7 on left river bank.
M-4	M- 90.7	Monongahela River near Pt. Marion, Pa. Station is located on land mass of Lock 8 on left river bank.
M-5	M- 98.0	Monongahela River near Morgantown, W. Va. Station is located where Highway 7 Bridge crosses the river.
M-6	M-124.6	Monongahela River near Fairmont, W. Va. Station is located at Lock 15 (Hoult, W. Va.).
MD-7	MD-87.1-3.5	Dunkard Creek near Shannopin, Pa. Station is located at U.S.G.S. Gaging Station 720.
MB-8	MB-125.4-3.0	Buffalo Creek near Barrackville, W. Va. Station is located at U.S.G.S. Gaging Station 615.
MW-9	MW-128.7-4.4	West Fork River south of Fairmont, W. Va. at the Highway 250 Bridge.
MW-10	MW-128.7-20.0	West Fork River near Gypsy, W. Va. at Highway 19 Bridge.

MONONGAHELA RIVER SYSTEM

STATION DESCRIPTIONS
(Continued)

TABLE NO. 1

STATION	RIVER MILE	DESCRIPTION
MW-11	MW-128.7- 31.9	West Fork River near Clarksburg, W. Va. at the U.S.G.S. Gaging Station 590.
MT-12	MT-128.7- 4.9	Tygart Valley River near Colfax, W. Va. at U.S.G.S. Gaging Station 570.
MT-13	MT-128.7- 18.6	Tygart Valley River near Grafton, W. Va. at Highway 50 Bridge.
MC-14	MC- 89.4- 3.5	Cheat River at Cheat Dam (Lake Lynn), Pa.
MC-15	MC- 89.4- 9.3	Cheat Lake at W. Va. State Highway 73 Bridge.
MC-16	MC- 89.4- 27.7	Cheat River north of Albright, W. Va. on State Highway 26.
MC-17	MC- 89.4- 45.0	Cheat River near Rowlesburg, W. Va. at U.S.G.S. Gaging Station 700 (R.R. Bridge).
MY-18	MY- 15.6- 12.4	Youghiogheny River near Sutersville, Pa. at U.S.G.S. Gaging Station 835.
MY-19	MY- 15.6- 44.4	Youghiogheny River in Connellsville, Pa. at the Crawford Avenue Bridge (State Highway 711).
MY-190	MY- 15.6- 58.7	Youghiogheny River near Ohiopyle, Pa. at Pa. Hwy. 381 Bridge (Bacteriological Only).
MY-20	MY- 15.6- 68.9	Youghiogheny River at Confluence, Pa. on State Highway 281 Bridge.
MY-21	MY- 15.6- 76.6	Youghiogheny Reservoir at U.S. Highway 40 Bridge (Pa.).
MY-210	MY- 15.6-111.9	Youghiogheny River west of Oakland, Md. just downstream from the B&O RR Bridge.

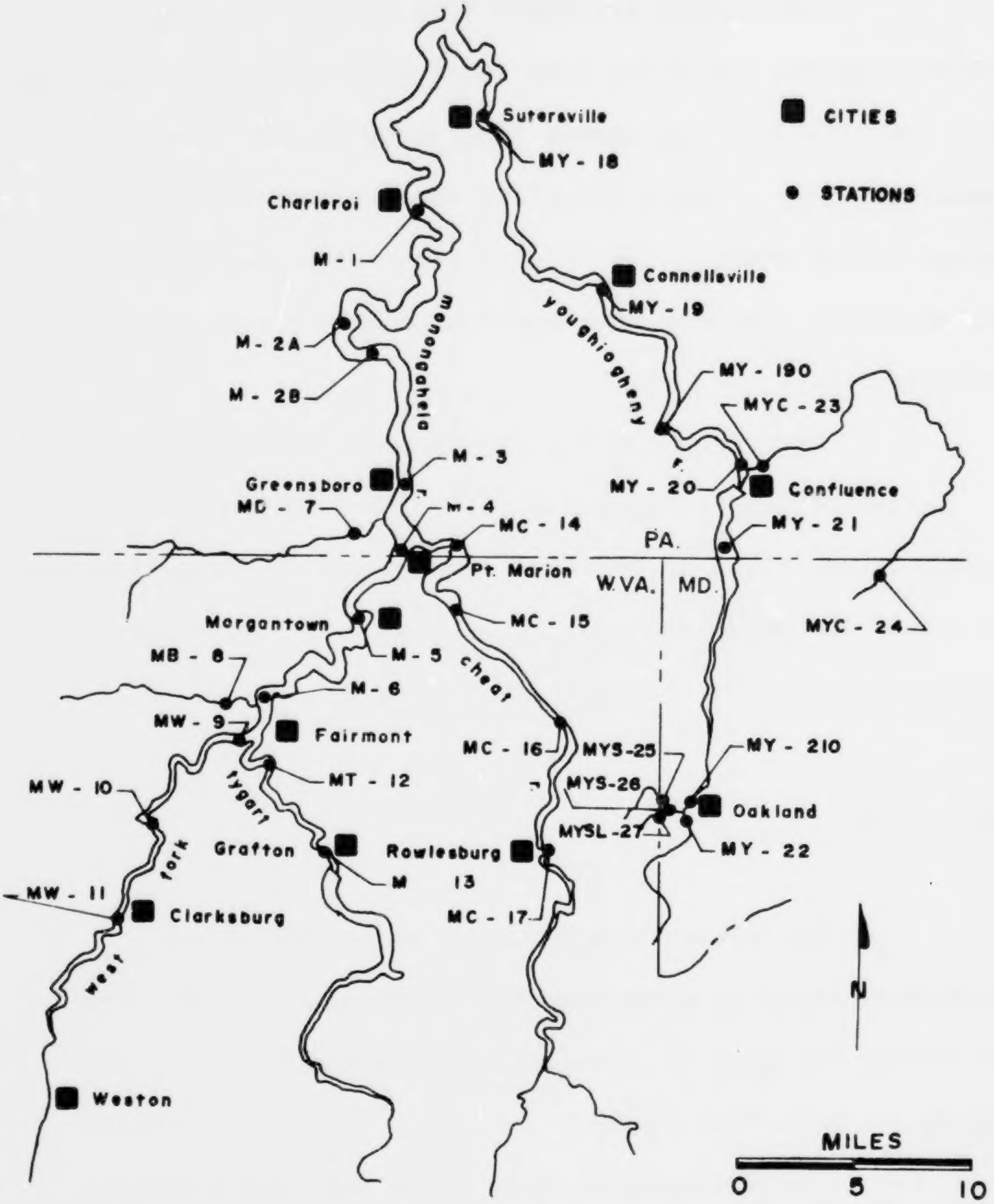
MONONGAHELA RIVER SYSTEM

STATION DESCRIPTIONS
(Continued)

TABLE NO. 1

STATION	RIVER MILE	DESCRIPTION
MY- 22	MY -15.6-119.5	Youghiogheny River south of Oakland, Md. on Silver Knob Road (8/14-8/25); Mansfield Rd. (8/26-8/30).
MYC-23	MYC -15.6- 63.6- 1.0	Casselman River near Confluence, Pa. at State Highway 53 Bridge.
MYC-24	MYC -15.6- 63.6-40.5	Casselman River near Grantsville, Md. at the River Road Bridge.
MYS-25	MYS -15.6-116.4- 3.1	Snowy Creek near Corinth, W. Va. - Hutton, Md. at State Line off W. Va. State Highway 7.
MYS-26	MYS -15.6-116.4- 1.0	Snowy Creek near Crellin, Md. off State Highway 39 near Crellin Mine.
MYSL-27	MYSL-15.6-116.4- 0.7-0.2	Laurel Run near Crellin, Md. off State Highway 39 south of Snowy Creek Sampling Station.
MTU- 29	MTU -11.5- 7.0	Turtle Creek in Trafford, Pa. at Stewart Street Bridge.

MONONGAHELA RIVER BASIN
SAMPLING STATIONS
CHART 2


■ CITIES
● STATIONS
Sutersville
MY - 18
Charleroi
M - 1
Connellsville
MY - 19
Monongahela
Youghiogheny
M - 2A
M - 2B
MY - 190
MYC - 23
M - 3
Greensboro
MY - 20
Confluence
MD - 7
M - 4
MC - 14
MY - 21
PA.
Pt. Marion
W.VA.
MD.
MYC - 24
Morgantown
MC - 15
M - 5
MB - 8
Cheat
M - 6
MW - 9
Fairmont
MC - 16
MYS-25
MY - 210
MT - 12
MW - 10
MYS-26
Oakland
Tygart
MYSL-27
MY - 22
Grafton
Rowlesburg
M 13
MW - 11
West Fork
Clarksburg
MC - 17
N
Weston
MILES
0
5
10

Individual chemical results obtained during August and September are recorded in Appendix A. Biological findings at each of the selected stations are recorded in Appendix B.

Calculated estimates were made of the organic and bacteriological pollution that would occur, assuming that the acid conditions of the stream are improved, and other wastes remain constant. Bacteriological data collected during the August and September, 1963 study, along with the calculated estimates for the West Fork and Monongahela are recorded in Appendix C.

Flow data for the 1963 study were obtained from the United States Geological Survey. The U.S.G.S. records indicate that flows during the study period were approximately one-third the average annual flows, and were approximately 20 percent below normal flows for the period.

WATER USES

The entire length of the main stem of the Monogahela River is canalized for navigation purposes from the Golden Triangle in Pittsburgh to the confluence of the Tygart and West Fork Rivers.

The Monongahela, West Fork, and Tygart Rivers serve as the source of water supply for 26 major public water systems, upstream of the Allegheny County line. The 26 systems serve a population of 337,000 people, using approximately 41.8 million gallons per day (mgd). Fourteen of the 26 systems are in Pennsylvania, upstream of the Allegheny County line, serving a population of 223,800. An additional population of 421,500 using 60 mgd obtains domestic water from the Monongahela in Allegheny County. The Youghiogheny serves as the source of supply to 7 major public water systems serving 44,500 people, using 5.75 mgd. Six of the 7 systems are in Pennsylvania, serving a population of 42,500. The Cheat River serves as the source of one public water system, serving 1,500 people, using 0.15 mgd. This system on the Cheat is in Pennsylvania. Table 2 lists the water systems using the main stems of the Monongahela, West Fork, Tygart, Cheat, and Youghiogheny Rivers as sources of water supply. Included in the table are the population served by each of the systems and the estimated daily use.

(Table 2 is as follows:)

MONONGAHELA RIVER SYSTEM

Public Water Supplies Taken From Main Rivers in the Monongahela River Basin

TABLE NO. 2

WATER SUPPLY		Population Served	Average Consumption MGD
Tygart River in West Virginia			
Phillippi		2,230	0.21
Elkins		8,300	1.20
Tygart Valley Homesteads		3,000	0.39
	SUB-TOTALS	13,530	1.80
Cheat River in Pennsylvania			
Pt. Marion		1,850	0.10
Lake Lynn		100	0.01
Spring Hill Township		4,000	0.52 (1)
	SUB-TOTALS	5,950	0.63
Cheat River in West Virginia			
NONE			

MONONGAHELA RIVER SYSTEM

Public Water Supplies Taken
From Main Rivers in the
Monongahela River Basin

TABLE NO. 2

WATER SUPPLY		Population Served	Average Consumption MGD
Monongahela River in West Virginia			
Morgantown		45,000	4.15
Booth		500	0.065 (1)
National		300	0.039 (1)
Everetteville		500	0.065 (1)
Jordan		400	0.052 (1)
	SUB-TOTALS.	46,700	4.44
West Fork River in West Virginia			
Spelter		550	0.19
Clarksburg		42,000	4.9
Weston		9,000	0.5
Weston State Hospital		2,000	0.26 (1)
	SUB-TOTALS	54,000	5.91

MONONGAHELA RIVER SYSTEM

Public Water Supplies Taken
From Main Rivers in the
Monongahela River Basin

TABLE NO. 2

WATER SUPPLY		Population Served	Average Consumption MGD
Youghiogheny River in Pennsylvania			
Smithton		650	0.03
Bannington		500	0.025
Buena Vista		10,000	0.45
Connellsville		12,800	2.5
Whitsett		550	0.19
No. Fayette Co. Municipal Authority		18,000	2.3
	SUB-TOTALS	42,500	5.495
Youghiogheny River in Maryland			
Oakland		2,000	0.26
	SUB-TOTALS	2,000	0.26

MONONGAHELA RIVER SYSTEM

Public Water Supplies Taken From Main Rivers in the Monongahela River Basin

TABLE NO. 2

WATER SUPPLY	Population Served	Average Consumption MGD
Totals of Water Supplies By Rivers:		
Main Stem Monongahela River	270,000	34.09
West Fork River	54,000	5.91
Tygart River	13,530	1.80
Cheat River	5,950	0.63
Youghiogheny River	44,500	5.75
Totals of Water Supplies By States:		
Pennsylvania	272,250	35.97
West Virginia	114,230	12.15
Maryland	2,000	0.26

(1) Values Based on Estimated Use of 130 Gal./Cap./Day.

MONONGAHELA RIVER SYSTEM

Public Water Supplies Taken From Main Rivers in the Monongahela River Basin

TABLE NO. 2

WATER SUPPLY	Population Served	Average Consumption MGD
Allegheny Co. Line to W. Va. - Pa. State Line: Monongahela River		
So. Pittsburgh Water Co. - Shire Oaks	100,000	16.0
Monongahela City Water Co.	11,500	1.5
Authority of The Borough of Charleroi	60,000	6.0
Municipal Authority of The Borough of Belle Vernon	6,500	0.4
Municipal Authority of Washington Township	7,000	0.5
California Water Co.	3,000	0.2
Brownsville Water Co.	12,000	1.0
Tri-County Jt. Municipal Authority	3,500	0.6
Municipal Authority of The Borough of Carmichaels	2,000	0.2
Southwestern Pa. Water Authority	10,000	1.8
Masontown Municipal Water Works	5,000	0.5
Alicia Water Co.	200	0.01
U. S. Steel Corp.	1,500	0.09
Dunkard Valley Jt. Municipal Authority	1,600	0.07
SUB-TOTALS	223,800	29.65

Industrial uses of the Monongahela surface waters exceed 6,000 mgd, including 4,000 mgd for cooling water. About 1,700 mgd is treated for various industrial uses. Approximately 1,500 mgd is used upstream of the Allegheny County line.

Industrial use of the Youghiogheny is centered primarily in that area downstream of the Allegheny County line

The Monongahela River system is used extensively for the disposal of sewage and industrial waste, and for the conveyance of acid mine drainage.

The upper section of the Monongahela is presently used to a limited extent for recreation including boating, bathing, and water skiing. These recreational uses also occur on the West Fork, Tygart, Cheat, and Youghiogheny. Fishing is limited to those reaches and tributaries not adversely affected by excessive acid mine drainage. With the increasing popularity of aquatic recreational activities, it is anticipated that this use will increase, particularly if there is improvement in water quality.

Two reservoirs are operated in the basin to produce peak load power. These are Lake Lynn on the Cheat River near the West Virginia-Pennsylvania State line, and Deep Creek reservoir on Deep Creek, a tributary to the Youghiogheny in Maryland. Two reservoirs are operated for low flow control. These are Tygart Reservoir on the Tygart

River, and the Youghiogheny Reservoir on the Youghiogheny.

The Cheat River is used as a source of cooling water by the thermal electric plant at Albright, West Virginia.

SOURCES OF WASTES

GENERAL

The major pollutional problem in the Monongahela Basin is the acid mine drainage. The acidity of the streams, resulting from acid mine drainage, has caused great damage to water uses and has served as an excuse to postpone the abatement of organic and bacterial pollution.

The 1943 U.S. Public Health Service Report states that an original load of 920,000 tons of acid (to phenolphthalein - hot) in mine drainage was discharged to the basin streams annually. Through a mine sealing program, this annual load had been reduced to 646,000 tons by 1940. The report indicated that an additional 199,000 tons per year could be removed economically by a continued sealing program. Supplement C of the 1943 Public Health Service Report, titled Acid Mine Drainage Studies," pointed out that probably not over 10 percent of the total mine acid load came from working mine areas. This indicated that 90 percent came from completely abandoned mines, abandoned sections of active workings, or from the disposal of low grade coal and other waste materials from both working and abandoned mines.

Current information on the numbers of active and abandoned mines discharging acid to the streams is not presently available. Information provided by the West Virginia State Department of Mines shows that 496 active mines, 407 underground and 89 surface, were operating in the West Virginia section of the Monongahela Drainage Area in 1962. Determining the location and quantities of acid discharges will require extensive investigations and studies.

MONONGAHELA, WEST FORK, AND TYGART RIVERS

In the reach considered, to the Allegheny County line, a total population of 248,000 discharges sewage to the Monongahela, West Fork, and Tygart rivers. In addition to the population discharging wastes to the streams, industries, other than mines, discharge organic wastes having a combined oxygen demand equivalent to that from a population of approximately 250,000.

Communities discharging sewage to the Monongahela and tributaries are listed in Tables 3 and 3A. Bacterial discharges of each of the municipalities discharging to the Monongahela, West Fork, and Tygart are indicated on Tables

A. D. Sidio

3 and 3A.

(Tables 3 and 3A are as follows:)

MONONGAHELA RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS - 1963

TABLE NO. 3

LOCATION	River Miles * Above Mouth	Est. Pop. Served**	Treatment Provided***	Est. Proportion Coliform Remaining****	Est. B.P.E.***** to Streams
CHEAT RIVER	89.5				
Rowlesburg, W. Va.	45	1,450	P & Cl	0.05	72
Salt Lick Creek	45				
Terra Alta, W. Va.	45-10	1,470	N	1.00	1.470
Indians Creek	34				
Kingwood, W. Va.	34-2	2,000	N	1.00	2,000
W. Va. - Penn. State Line	3.5				
Lake Lynn, Pa.	3	100	N	1.00	100
MONONGAHELA RIVER					
Dunkard Creek	87.1				
Brave, Pa.	87.1-14	150	P	0.50	80
Mount Morris, Pa.	87.1-11	100	N	1.00	100
Bobtown, Pa.	87.1- 6	1,820	P	0.50	910
Shannopin Coal Co.	87.1- 3	670	P	0.50	340
Georges Creek	84.9				
Fair Chance, Pa.	84.9-11	200	N	1.00	200
Gallatin Joint School	84.9- 7	580	(Sc)P	(.30) .15	90
Greensboro, Pa.	84	800	P	0.50	400
Grays Landing, Pa.	81	100	N	1.00	100

MONONGAHELA RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS - 1963

TABLE NO. 3

LOCATION	River Miles* Above Mouth	Est. Pop. Served**	Treatment Provided***	Est. Proportion Coliform Remaining****	Est. B.P.E.***** to Streams
MONONGAHELA RIVER (Cont.)					
Coal Center, Pa.	51	200	N	1.00	200
Elco, Pa.	48	500	N	1.00	500
Roscoe, Pa.	48	1,400	N	1.00	1,400
Stockdale, Pa.	47	800	N	1.00	800
Allenport, Pa.	46	400	N	1.00	400
Fayette City, Pa.	46	1,600	N	1.00	1,600
Dunlevy, Pa.	46	400	N	1.00	400
Downers Run	46				
Fayette Co. Housing Auth.	46.2	380	S	0.10	40
Belle Vernon, Pa.	43	2,350	N	1.00	2,350
North Belle Vernon, Pa.	43	2,900	N	1.00	2,900
Speers, Pa.	43	800	N	1.00	800
Twilight, Pa.	43	320	N	1.00	320

MONONGAHELA RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS - 1963

TABLE NO. 3

LOCATION	River Miles* Above Mouth	Est. Pop. Served**	Treatment Provided***	Est. Proportion Coliform Remaining****	Est. B.P.E.***** to Streams
MONONGAHELA RIVER (Cont.)					
Dunlap Creek	56				
New Salem, Pa.	56-11	600	N	1.00	600
Menallen Twp. School	56- 8	400	(Sc) P	(0.30) 0.15	60
Republic-Cardale, Pa.	56- 5	600	N	1.00	600
Fayette Co. Housing Auth.	56- 3	500	S	0.075	40
Brownsville, Pa.	56	7,000	N	1.00	7,000
West Brownsville, Pa.	56	1,500	N	1.00	1,500
Redstone Creek	55				
Uniontown, Pa.	55-17	25,000	S	0.10	2,500
Enterprise Co.	55-16	100	S	0.10	10
Franklin Co. School	55- 8	500	(Sc) P	(0.30) 0.15	80
Smock, Pa.	55- 6	2,800	N	1.00	2,800
California, Pa.	52	2,600	N	1.00	2,600
State Teachers College	52	900	(Sc) N	(0.3)	270
Pike Run	51.3				
Centerville, Pa.	51.3-4	1,200	S	0.10	120
Crescent Heights	51.3-2	600	P	0.50	300

MONONGAHELA RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS - 1963

TABLE NO. 3

LOCATION	River Miles* Above Mouth	Est. Pop. Served**	Treatment Provided***	Est. Proportion Coliform Remaining****	Est. B.P.E.***** to Streams
MONONGAHELA RIVER (Cont.)					
Masontown, Pa.	79	3,000	N	1.00	3,000
Nemacolon, Pa.	76	2,500	N	0.50	1,200
Muddy Creek	73				
Carmichaels, Pa.	73-4	2,700	P	0.50	1,350
Rices Landing, Pa.	68	150	N	1.00	150
Ten Mile Creek	66				
Bethlehem Mines Co.	66-10	400	P	0.50	200
Marianna, Pa.	66- 5	1,100	N	1.00	1,100
Bethlehem Joint Schools	66- 4	760	(Sc) P	(.30) .15	120
Wash. Co. Housing Auth.	66- 3	300	S	0.10	30
Clyde #3	66- 3	750	N	1.00	750
So. Fork Ten Mile Creek	66- 2				
Waynesburg, Pa.	66- 2-16	6,000	S	0.10	600
Jefferson, Pa.	66- 2- 6	440	N	1.00	440
Clyde #2	66- 2- 3	350	P	0.50	180
Teagarden Homes	66- 2- 0	600	P	0.50	300
Clarksville Muni.San.Auth.	66- 2- 0	100	N	1.00	100
Luzerne Twp., Pa.	66	1,300	N	1.00	1,300
Fredericktown-Millboro	65	300	N	1.00	300

MONONGAHELA RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS - 1963

TABLE NO. 3

LOCATION	River Miles* Above Mouth	Est. Pop. Served**	Treatment Provided***	Est. Proportion Coliform Remaining****	Est. B.P.E.***** to Streams
TYGART RIVER	(128.7)				
Grafton, W. Va.	18.6	7,400	N	1.00	7,400
MONONGAHELA RIVER					
Fairmont, W. Va.	127	25,000	N	1.00	25,000
Buffalo Creek	126.5				
Mannington, W. Va.	126.5-14	3,160	N	1.00	3,160
Farmington, W. Va.	126.5- 8	880	N	1.00	880
Paw Paw Creek	122.6				
Fairview, W. Va.	122.6-11	830	P & Cl	0.05	40
Grant Town, W. Va.	122.6- 5	2,100	N	1.00	2,100
Rivesville, W. Va.	123	1,550	P	0.50	780
Deckers Creek	101				
Reedsville, W. Va.	101-17	320	P & Cl	0.05	20
Masontown, W. Va.	101-12	910	N	1.00	910
Morgantown, W. Va.	101	26,000	N	1.00	26,000
Westover, W. Va.	101	1,750	N	1.00	1,750
Star City, W. Va.	98	1,770	N	1.00	1,770
W. Va. - Penn. State Line	91.2				
Point Marion, Pa.	90	3,300	N	1.00	3,300

MONONGAHELA RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS - 1963

TABLE NO. 3

LOCATION	River Miles* Above Mouth	Est. Pop. Served**	Treatment Provided***	Est. Proportion Coliform Remaining****	Est. B.P.E.***** to Streams
WEST FORK RIVER	(128.7)				
Weston, W. Va.	61	8,300	P & Cl	0.05	420
State Hospital	61	3,000	S & Cl	0.01	30
4-H Camp	57	500	P	0.50	250
Hacker Creek	50				
Jane Lew, W. Va.	50-4	500	N	1.00	500
Elk Creek	31				
Nutter Fort, W. Va.	31-4	2,300	N	1.00	2,300
Clarksburg, W. Va.	30	20,000	N	1.00	20,000
Simpson Creek	23				
Bridgeport, W. Va.	23-8	1,600	N	1.00	1,600
10 Mile Creek	19				
Salem, W. Va.	19-13	3,000	S & Cl	0.01	30
Lumberport, W. Va.	19-1	1,300	N	1.00	1,300
Shinnstown, W. Va.	15	2,800	N	1.00	2,800
Worthington, W. Va.	10	350	N	1.00	350
Monongah, W. Va.	4.3	1,800	P & Cl	0.05	90

MONONGAHELA RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS - 1963

TABLE NO. 3

LOCATION	River Miles* Above Mouth	Est. Pop. Served**	Treatment Provided***	Est. Proportion Coliform Remaining****	Est. B.P.E.***** to Streams
MONONGAHELA RIVER (Cont.)					
Charleroi, Pa.	41	10,500	N	1.00	10,500
North Charleroi, Pa.	41	2,650	N	1.00	2,650
Monessen, Pa.	39	18,000	N	1.00	18,000
Donora, Pa.	36	13,200	N	1.00	13,200
Allegheny Co. Line	35				

* River miles from Jan. 1961 Rev. of U. S. Army Monongahela River Navigation Charts.

** Based on estimated 1963 sewered population.

*** Treatment facilities; existing and under construction. Proposed treatment facilities in those cases where Federal Treatment Plant Construction Grants have been authorized.

Type of Treatment: P = Primary Treatment
S = Secondary Treatment
Cl = Chlorination
Sc = School (assume .30 BPE/student)

**** Estimated proportion coliform remaining: P = 50% remaining
S = 10% "
P & Cl= 5% "
S & Cl= 1% "

***** Bacterial Population Equivalent

YOUGHIOGHENY RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS - 1963

TABLE NO. 3-A

Location	River Miles Above Confluence With Monongahela R.	Estimated Population Served**	Treatment Provided***	Estimated Proportion Coliform Remaining ****	**Estimated B.P.E. ***** To Stream**
Casselman River					
Grantsville, Md.	70-51	470	P	0.50	235
Pa. - Md. State Line	70-47				
Salisbury, Pa.	70-44	100	N	1.00	100
Myersdale, Pa.	70-34	2600	N	1.00	2600
Myersdale Joint School District		800	P	0.50	400
Buffalo Creek	70-28				
Berlin, Pa.	70-28-8	250	P	0.50	125
Garrett, Pa.	70-28	500			
Coxes Creek	70-22				
Somerset, Pa.	70-22-9	5400	S	0.10	540
Rockwood, Pa.	70-22	850	N	1.00	850
Confluence, Pa.	70-0.1	800	N	1.00	800
Youghiogheny River					
Oakland, Md.	114	1640	N	1.00	1640

YOUGHIOGHENY RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS* - 1963

TABLE NO. 3-A

Location	River Miles Above Confluence With Monongahela R.	Estimated Population Served**	Treatment Provided***	Estimated Proportion Coliform Remaining****	Estimated B.P.E.***** To Stream
Friendsville, Md.	87	500	N	1.00	500
Pa. - Md. State Line	80				
Dunbar Creek	44				
Dunbar, Pa.	44-3	400	N	1.00	400
So. Connellsville, Pa.	44	2550	P	0.50	1275
Connellsville, Pa.	42	12,900	P	0.50	6450
Mounts Creek	42				
Bullskin Twp. School Dist.	42-5	800	S	0.10	80
Dickerson Run	37				
Vanderbilt, Pa.	37-1	500	N	1.00	500
Dawson, Pa.	37	780	N	1.00	780
Washington Run	31				
Star Junction, Pa.	31-3	120	N	1.00	120
Perryopolis	31-1	1900	S	0.10	190
Perry Twp., Pa.	31-1	120	N	1.00	120
Jacobs Creek	27				
Shupes Run	27-15				
Mt. Pleasant Twp.	27-15-3	5300	N	1.00	5300

YOUGHIOGHENY RIVER SYSTEM

ESTIMATED TOTAL COLIFORM BACTERIAL LOADS TO STREAMS - 1963

TABLE NO. 3-A

Location	River Miles Above Confluence With Monongahela R.	Estimated Population Served**	Treatment Provided *	Estimated Proportion Coliform Remaining ****	Estimated B.P.E.***** To Stream
Jacobs Creek	27				
Everson, Pa.	27-11	1600	N	1.00	1600
Scottdale, Pa.	27-11	6300	N	1.00	6300
Smithton, Pa.	24	325	N	1.00	325
West Newton, Pa.	18	2200	N	1.00	2200
Sewickley Creek	17				
Calumet, Pa.	17-20	700	P	0.50	350
Jacks Run	17-17				
Greensburg, Pa.	17-17-6	21,600	P	0.50	10,800
Youngwood, Pa.	17-17-1	2500	N	1.00	2500

** Based on estimated 1963 sewered population.

*** Treatment facilities; existing and under construction. Proposed treatment facilities in those cases where Federal Treatment Plant Construction Grants have been authorized.

Type of Treatment: P = Primary Treatment
S = Secondary Treatment
Cl = Chlorination
Sc = School (assume .30 BPE student)

**** Estimated proportion coliform remaining: P = 50% remaining
S = 10% "
P & Cl= 5% "
S & Cl= 1% "

Bacterial Population Equivalent

Bacterial discharges of each of the municipalities discharging to the Monongahela, West Fork, and Tygart are indicated on Charts 7 and 7A. Known industries are listed in Appendix D. The potential effect of the municipal and industrial wastes on the river cannot be evaluated from the river sampling data because of the acid conditions of the stream during the study. Such an evaluation would require extensive studies on the specific waste discharges.

The 1959 ORSANCO Report lists a total organic load of 664,000 population equivalents (PE) being discharged to the Monongahela and West Fork rivers. This includes wastes from municipalities and industries discharging directly to the West Fork and Monongahela rivers, and those discharging to the tributaries within 20 miles of confluence with the Monongahela or West Fork.

The December 1962 Pennsylvania Department of Health Report to the Sanitary Water Board on the Main Stem of the Monongahela River states in part:

> " ... about 78,000 ... people discharge sewage to the Monongahela River between the West Virginia-Pennsylvania State line and the Allegheny County line ...

In the reach between the State line and the Allegheny County line, the principal sources of acid mine drainage to the main stem of the Monongahela are from Cheat

River, Dunkard Creek, Georges Creek, Whitely Creek, Cat Creek, Jacobs Creek, and Browns Run.

CHEAT RIVER

The Cheat River receives acid mine drainage and the sewage from four municipalities with a total population of approximately 5,000 (Chart 7C). In Pennsylvania several acid mine discharges and the wastes from a coal washing operation enter the Cheat River below Lake Lynn prior to its confluence with the Monongahela.

DUNKARD CREEK

Dunkard Creek receives acid mine discharges, and sewage from a population of 2,700 (Chart 7).

YOUGHIOGHENY RIVER

Snowy Creek and Laurel Run, tributary to the upper Youghiogheny (Chart 7B), receive the acid water discharges of 5 strip mines, 31 dry drift mine openings (19 of which are located inside the strip mine areas), 3 mine openings and 6 boreholes in a combined drainage area of 21 square miles in West Virginia. Snowy Creek also receives sewage discharges from the Corinth-Terra Alta, West Virginia areas.

The Youghiogheny is again of interstate concern as it flows from Maryland into Pennsylvania. In that section between the points of interstate concern the Youghiogheny receives waste discharges in the Oakland, Maryland area below the confluence with the Little Youghiogheny. However, this problem is intrastate, and not interstate. Friendsville, Maryland, discharges raw sewage to the Youghiogheny upstream of the Youghiogheny Reservoir, through which the State line crosses.

The Youghiogheny River between the Maryland-Pennsylvania State line and the Allegheny County line receives additional acid mine drainage from the Casselman River and in the reach upstream of Sutersville. The Youghiogheny drainage area in Pennsylvania receives sewage discharges from approximately 66,000 people.

CASSELMAN RIVER

The Casselman River is tributary to the Youghiogheny and is interstate between Maryland and Pennsylvania. The upstream reaches of the Casselman receive some acid discharges. Grantsville, Maryland, discharges inadequately treated sewage to the Casselman just upstream of the State line.

TREATMENT FACILITIES PROVIDED

Municipalities presently providing treatment include Weston, Monongah, Philippi, and Rivesville, West Virginia; and Uniontown, Bobtown, Waynesburg, Centerville, Somerset, Perropolis, Connellsville, Jefferson Township, Tea Garden Homes-Morgan Township, Berlin, and Peters Township, Pennsylvania.

In 1944, the main stem of the Monongahela River from the West Virginia-Pennsylvania State line to the Allegheny County line was classified by the Sanitary Water Board of Pennsylvania as requiring primary treatment of waste discharges. In 1945 and 1946 the Sanitary Water Board issued orders to municipalities and industries on the Monongahela to abate the discharge of wastes to the waters of the Commonwealth, and to prepare plans for the necessary treatment works. Most of the municipalities and industries complied with the order to prepare plans. However, the majority at present continue to discharge untreated wastes to the Monongehla River.

In August, 1963, the Division of Sanitary Engineering, Pennsylvania Department of Health, submitted a report to the Sanitary Water Board on the Classification of the Main Stem of the Monongahela River. Work on the report was initiated in 1962. As a result of the report, numerous hearings have recently been scheduled by the Sanitary Water Board. On August 30th, notices were sent out, and during the month of September, 1963, Sanitary Water Board Hearings were held for the following: (Note: This list does not include four municipalities in Allegheny County for which hearings were held) Brownsville, Fayette City Borough, Belle Vernon, Point Marion, Greensboro, New Eagle, California, Donora, Monessen, Charleroi, Stockdale, Elco, Roscoe, Allenport, Dunlevy, City of Monongahela, West Brownsville, North Charleroi, and Speers. A Sanitary Water Board Hearing was held for North Belle Vernon in December 1963. Notices for this hearing were sent out on October 11th.

The following hearings are scheduled before the Sanitary Water Board in December: Newell Borough, Dunbar Township, Brownsville Township, Dawson Borough, Dunbar Borough, Fairchance Borough, Masontown Borough, Smithfield Borough, Rices Landing, Cokesburg Borough, East Bethlehem Township, Marianna Borough, Irwin Borough, Export Borough, Hempfield Township, Manor Borough, Rostraver Township.

Information included in Tables 3 and 3A indicates that 33 percent of the sewered population in the Monongahela Basin in West Virginia is served by some degree of treatment; in Pennsylvania, 45 percent upstream of Allegheny County; and, in Maryland, 18 percent.

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EFFECTS OF WASTES ON WATER QUALITY AND USES

GENERAL

Mine drainage, containing sulfuric acid and acid salts (sulfates), which reaches the surface streams in the bituminous coal mining area in West Virginia, Maryland, and Pennsylvania, is the most damaging waste in the Monongahela River Basin. In 1961 West Virginia was the leading bituminous coal-producing State in the country with a production of over 113 million tons. Pennsylvania was third with over 62 million tons.

Mine drainage is rendered acid by chemical and possibly biochemical reactions involving water, oxygen, and the sulfur in pyrite, marcasite, and other minerals and ores commonly found with coal deposits.

Acid mine drainage changes the natural chemical character of the water in streams. These changes are produced by the reaction of the acid with the natural alkalinity in the stream, resulting in the conversion of carbonate to non-carbonate hardness, and lowering the pH values. The acid waters flowing over calcium or magnesium bearing rock formations dissolve additional calcium and magnesium with further increases in hardness.

The effects of the organic and bacterial pollution on the receiving waters are in general masked by the acid conditions. The inhibiting effect of the acid conditions on bacteria and the coagulating action of the iron salts on organic wastes reduce or prevent odor and nuisance conditions which otherwise would occur in many stream reaches during the normal stream flows. However, sludge deposits and floating sewage materials are present at and below sewer outlets. The acid condition of a stream is not a constant safeguard to public water supplies and public health, since high flows may temporarily eliminate the acid conditions in a stream and allow sewage bacteria to survive. At such times, the need for germicidal effect is great.

The results of the chemical changes in streams receiving excessive acid discharges are severe and cause considerable damage. The water is expensive and difficult to treat for municipal and certain industrial uses. The stream is highly corrosive to steel and iron structures, such as barges, boats, bridge supports, culverts, pumps, and concrete structures. The stream is made unfit for recreational uses such as fishing, boating, and swimming. The biological processes are either eliminated or altered to the point where the stream no longer sustains desirable aquatic life, including fish.

The masking of the organic and bacterial pollution in the Monongahela Basin by the acid conditions does not reduce the degrading capabilities of these wastes. The reduction of either the acid loads or the organic wastes alone will not return the streams to their most useful condition. The usefulness of the streams is damaged by both, and both should be reduced.

COMPARISON - 1940-1963 DATA

The 1943 U.S. Public Health Service Report (House Document 266 - 78th Congress) contained an estimate that a 1940 load of 646,000 tons of acid was being discharged to the Monongahela Basin annually. A comparison of the 1940 and 1963 conditions of the surface waters is presented in Table 4.

(Table 4 is as follows:)

MONONGAHELA RIVER SYSTEM

CHEMICAL COMPARISON: 1940 AND 1963

TABLE NO. 4

STATION	RIVER MILE	pH 1940	pH 1963	Flow in cfs 1940	Flow in cfs 1963	Hot Acidity As $CaCO_3$ 1940 mg/l	Hot Acidity As $CaCO_3$ 1940 tons/day	Hot Acidity As $CaCO_3$ 1963 mg/l	Hot Acidity As $CaCO_3$ 1963 tons/day	Alkalinity As $CaCO_3$ 1940 mg/l	Alkalinity As $CaCO_3$ 1940 tons/day	Alkalinity As $CaCO_3$ 1963 mg/l	Alkalinity As $CaCO_3$ 1963 tons/day	Hardness as $CaCO_3$ 1940 mg/l	Hardness as $CaCO_3$ 1963 mg/l	Date in 1940 MONTH	Date in 1940 DAYS
M-1	M- 41.4	3.6	4.0	1916	2402	35	181	24	156	-	-	-	-	105	173	Oct.	2, 8, 17, 22, 30
M-3	M- 85.0	3.8	3.8	1476	2441	21	84	22	145	-	-	-	-	-	106	Oct.	2, 8, 17, 22, 30
M-4	M- 90.7	3.8	3.9	1090	1940	21	62	24	126	-	-	-	-	-	133	Oct.	2, 8, 17, 22, 30
M-5	M- 98.0	4.0	4.1	2150	1710	46	267	23	106	-	-	-	-	-	143	May	16, 23
M-6	M-124.6	4.5	5.5	4230	1544	20	228	16	67	5	57.0	4	17	-	145	June	4, 12, 26
MD-7	MD- 87.1-3.5	-	2.8	-	4.8	-	-	858	11	-	-	-	-	-	1026	-	-
MD-8	MD-125.4-3.0	5.2	7.2	150	13.3	24	9.7	-	0	10	0.4	93	3.3	-	359	June	4
MW-9	MW-128.7-4.4	3.6	4.1	780	501	58	122	28	38	-	-	-	-	-	265	June	12, 26
MW-10	MW-128.7-20.0	4.8	4.1	490	315	26	34.4	70	59.5	3	4.0	-	-	-	402	May; July	20; 10
MW-11	MW-128.7-31.9	6.6	6.8	280	200	-	-	3	2	23	17.4	27	15	-	209	June; July	28; 2, 10
MT-12	MT-128.7- 4.9	6.8	6.0	1630	1094	-	-	2	6	-	-	4	11	27	42	June	26
MT-13	MT-128.7-18.6	6.8	5.7	1620	1040	-	-	4	11.2	-	-	3	8.4	-	42	June	28
MC-14	MC- 89.4- 3.5	6.1	4.5	1220	1330	-	-	10	35.9	8	26.4	1	3.6	-	45	June	22
MC-15	MC- 89.4- 9.3	6.5	5.1	1220	1300	-	-	5	17.5	8	26.4	3	10.5	-	40	June	22
MC-16	MC- 89.4-27.7	6.9	6.1	1600	960	-	-	4	10.4	29	125	5	13	-	36	June	24
MC-17	MC- 89.4-45.0	6.9	6.7	1550	913	-	-	2	5.0	28	117	10	25	-	28	June	24
MY-18	MY- 15.6-12.4	4.5	5.5	845	859	4	9.1	11	26	-	-	4	9	77	84	Sept.	19
MY-19	MY- 15.6-44.4	6.9	6.6	1020	802	-	-	2	8	12	33	5	2	42	37	Nov.	18
MY-20	MY- 15.6-68.9	5.4	6.4	755	772	9	18.4	2	4	7	14.3	7	1	-	22	July	16, 25
MY-21	MY- 15.6-76.6	5.4	6.4	318	121	8	6.9	2	0.65	8	6.9	8	3.6	-	21	July	16, 25
MY-210	MY- 15.6-111.9	5.3	6.6	382	83	14	14.4	3	0.67	20	20.6	11	2.5	32	34	June	18, 24
MY-22	MY- 15.6-119.5	-	6.7	-	78	-	-	2	0.42	-	-	14	3	-	24	-	-
MYC-23	MYC-15.6- 63.6-1.0	3.9	4.2	285	55	28	21.5	34	5	-	-	-	-	-	185	July	16, 25
MYC-24	MYC-15.6- 63.6-40.5	3.2	6.2	33	13.5	110	9.8	2	0.07	-	-	1	0.55	-	85	July	24
MYS-25	MYS-15.6-116.4-3.0	5.5	6.4	86	36	7	1.6	4	0.39	19	4.4	12	2.2	31	38	June	18
MYS-26	MYS-15.6-116.4-1.0	-	6.3	-	36	-	-	4	0.39	-	-	13	1.3	-	35	-	-
MYSL-27	MYSL-15.6-116.4-0.7-0.2	-	3.5	-	20	-	-	65	3.5	-	-	-	-	-	54	-	-

NOTE: (1) Data shown for 1940 taken from: Ohio River Pollution Control - Report of the U. S. Public Health Service. 78th Congress, 1st Session, House Document No. 266 U. S. Government Printing Office, Washington: 1944.

(2) Dates used in 1940 selected on basis of most comparable flows between 1940 and 1963.

It is not intended to imply that the results of the two surveys are fully comparable. The results obtained indicate the conditions of the stream at the times of sampling only.

The 1940 samples were obtained at intermittent intervals during the period May through December over a wide range of river discharges. The 1963 chemical data were collected during the latter two weeks of August, with a relatively narrow range of discharges. Data used from the 1940 study in Table 4 are those results obtained at the same stations used in 1963, and at periods of most nearly comparable stream flows.

DEFINITIONS: Methods of Analyses

Because of the variety of methods used in determining acidity and alkalinity values, it is pertinent to describe the methods used to obtain the results of the August and September, 1963 study.

Term	Definition
1. Hot Phenolphthalein Acidity ("Standard Methods 11th Ed. Page 340)	"Total Potential Mineral Acidity".

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	Term	Definition
2.	Cold Phenolphthalein Acidity	"Total Acidity by Standard Methods. Includes CO_2 but not all of the hydrolzable salts.
3.	Cold Methyl Orange (pH 4.5)	"Free Mineral Acidity".
4.	Cold Methyl Orange (pH > 4.5)	"Methyl Orange Alkalinity
5.	Acid Stream (1)	A stream is acid in character when it contains mineral acids and/or acid salts to the extent that the total acidity determined by the hot method, using phenolphthalein indicator exceeds the total alkalinity determined to methyl orange endpoint.

(1) This is the definition used by the Pennsylvania Sanitary Water Board, except that total alkalinity is determined to the bromphenol blue endpoint at pH 4.0.

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During the 1940 study by the U.S. Public Health Service, samples with pH values below 6.0 were analyzed by both the hot and cold phenolphthalein method. On samples with pH values less than 5.1, the phenolphthalein acidity and acidity to methyl red were determined. The hot phenolphthalein test in 1940 was run in accordance with "Standard Methods for the Examination of Water and Sewage" 8th Edition - 1936. The method differs from the present hot phenolphthalein method in that the sample was brought to a boil only, whereas the present method requires boiling the sample for two minutes.

ACID CONDITIONS

As previously indicated, the studies of 1940 and 1963 include insufficient data to evaluate the acid conditions of the streams for periods other than those during which the studies were conducted.

Although pH values do not measure directly the quantity of acidity in a stream, the values may be used as an indication of the changes in acidity that occur in the stream over a period of time.

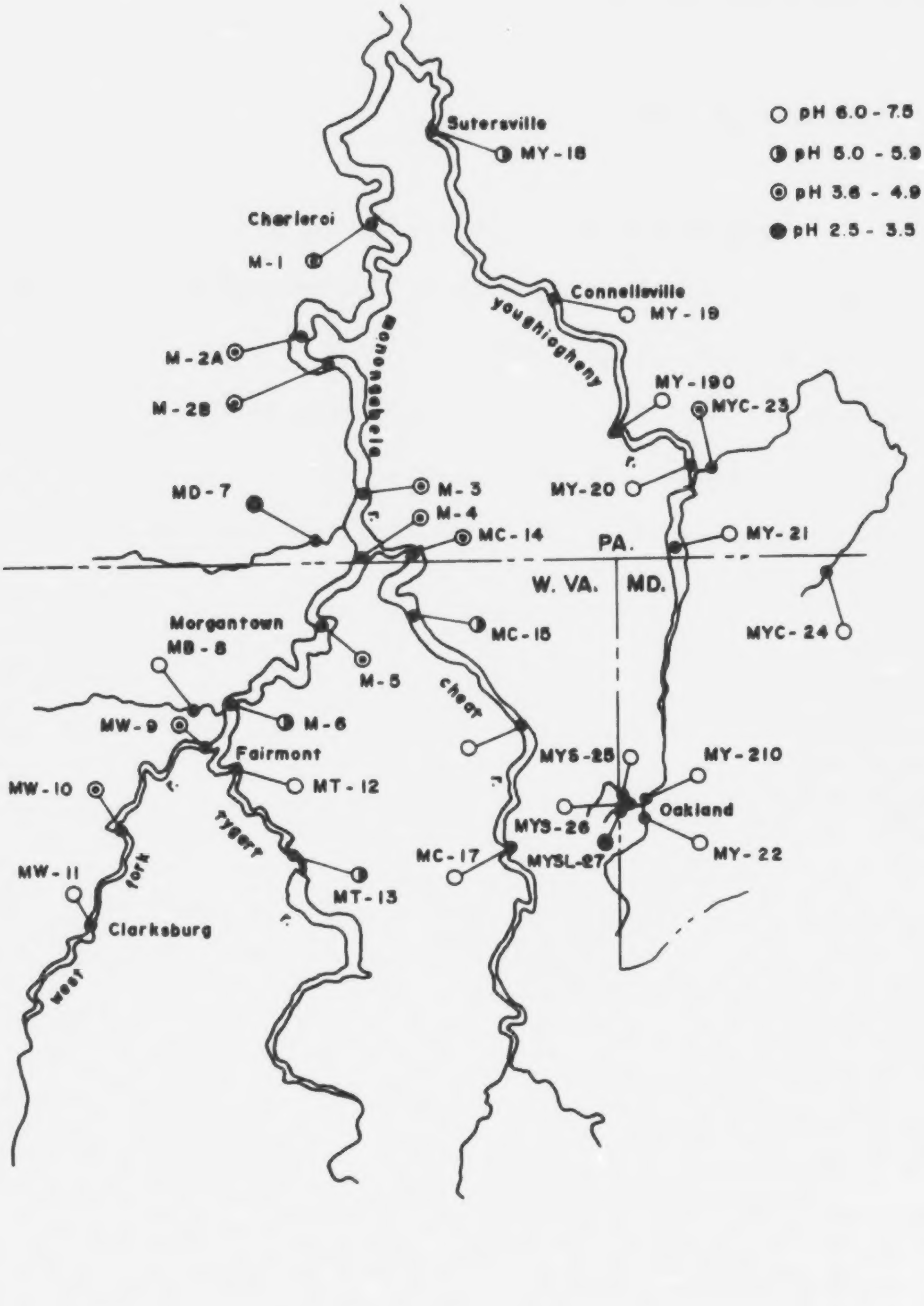
The ORSANCO Aquatic Life Advisory Committee concluded that pH values below 5.0 adversely affect aquatic life. For water treatment and other uses a desirable level would be a pH near or above the neutral level of 7.0. Results at all stations on the Monongahela during the 1963 study indicated an undesirable habitat for aquatic life with pH values less than 5.0. The Cheat River and Dunkard Creek had pH values less than 5.0. Laurel Run in the headwaters of the Youghiogheny had an average pH value of 3.5

Monongahela River

Comparison of pH values in Table 4 for the sampling points on the main stem of the Monongahela indicates that no significant change occurred from 1940 to 1963. Below Morgantown to Charleroi the 1940 pH values ranged from 3.8 to 4.1; the 1963 values had an identical range. pH values observed during the 1963 study are indicated on Chart 3.

(Chart 3 is as follows:)

MONONGAHELA RIVER BASIN
pH VALUES
CHART 3


○ pH 6.0 - 7.5
◐ pH 5.0 - 5.9
◎ pH 3.6 - 4.9
● pH 2.5 - 3.5
Sutersville
MY-18
Charleroi
M-1
Connellsville
MY-19
youghiogheny r.
Monongahela r.
M-2A
M-2B
MY-190
MYC-23
MD-7
M-3
M-4
MC-14
MY-20
MY-21
PA.
W. VA.
MD.
MYC-24
Morgantown
MB-8
MC-15
M-5
M-6
MW-9
cheat r.
Fairmont
MT-12
MYS-25
MY-210
MW-10
Oakland
MYS-26
MYSL-27
MY-22
MC-17
tygart r.
MT-13
MW-11
west fork r.
Clarksburg

A. D. Sidio

The little dotted circle indicates the pH value between 6 and 7.5, which is a very desirable range.

The half-circle indicates the 5.0 to 5.9 range.

The circle with the smaller circle indicates a pH range of 3.6 to 4.9.

The solid circle indicates values from 2.5 to 3.5.

Average acid loads in tons per day are quite erratic with some values for 1963 exceeding those of 1940, and the reverse in other cases. The 1963 data show an increase in the acid load as the stream flows from Fairmont, West Virginia, 67 tons per day, to Charleroi, Pennsylvania, 156 tons per day. The data on the mainstem of the Monongahela from Fairmont to Charleroi indicate that acid loads discharged to the surface waters in and upstream of this reach of the river have remained relatively the same since 1940. At Point Marion, near the State line, the river carried 126 tons of acid per day. The acid conditions of the Monongahela River damage water supplies, fixed metal structures, boats and barges, pumps and intake structures in both West Virginia and Pennsylvania.

Calculated estimates included in the 1943 Public Health Service Report indicate that at the turn of the century the Monongahela, above the confluence with the

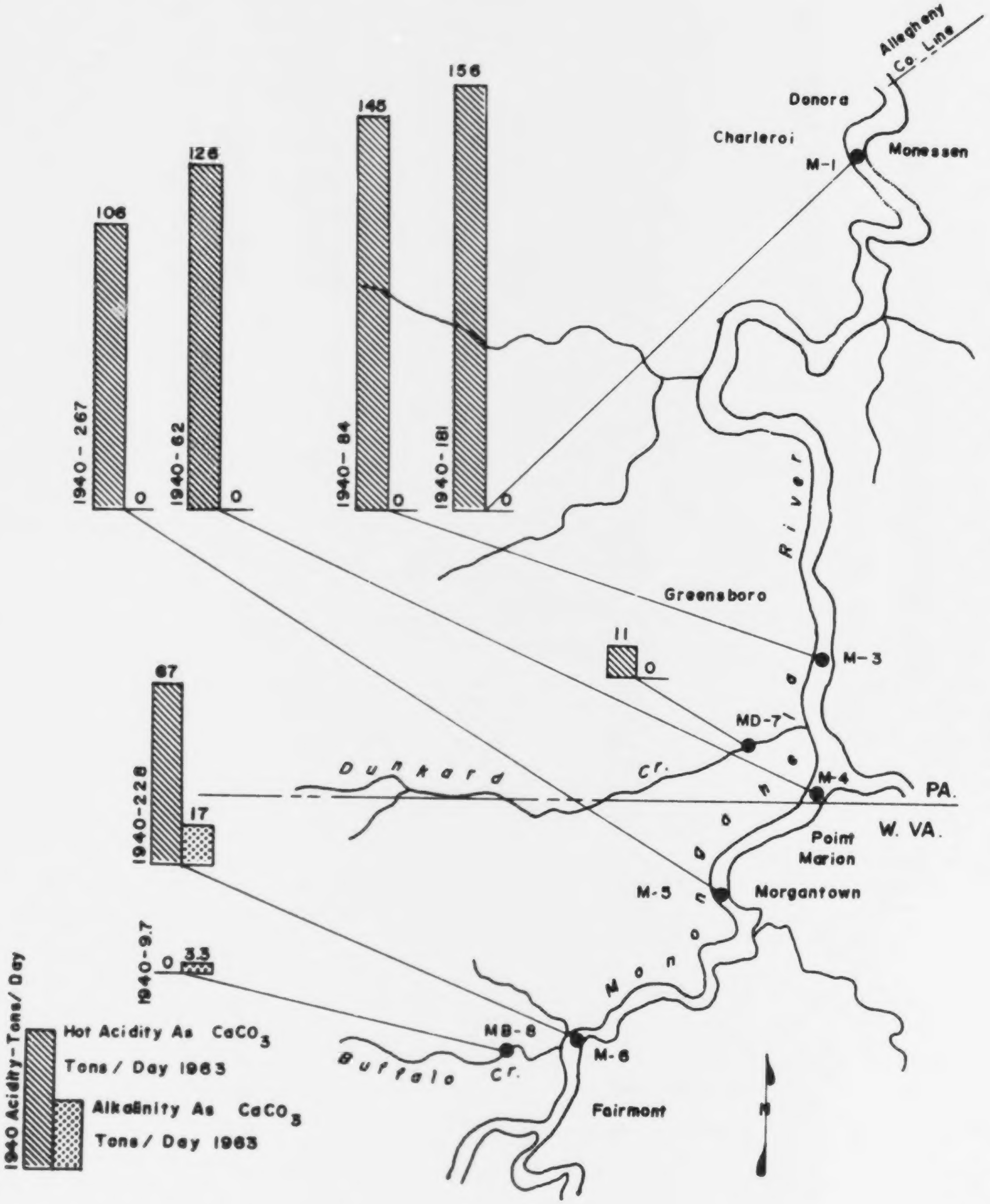
Youghiogheny, contained about 10 mg/l of alkalinity. These calculations indicate that the original natural drainage did not contribute excessive acidity to the Monongahela River

The average acidity and alkalinity loads in the streams are indicated in tons per day for the 1963 study in Charts 4, 4A, 4B and 4C. Available 1940 data are shown to the left of the bars.

(Charts 4, 4A, 4B and 4C are as follows:)

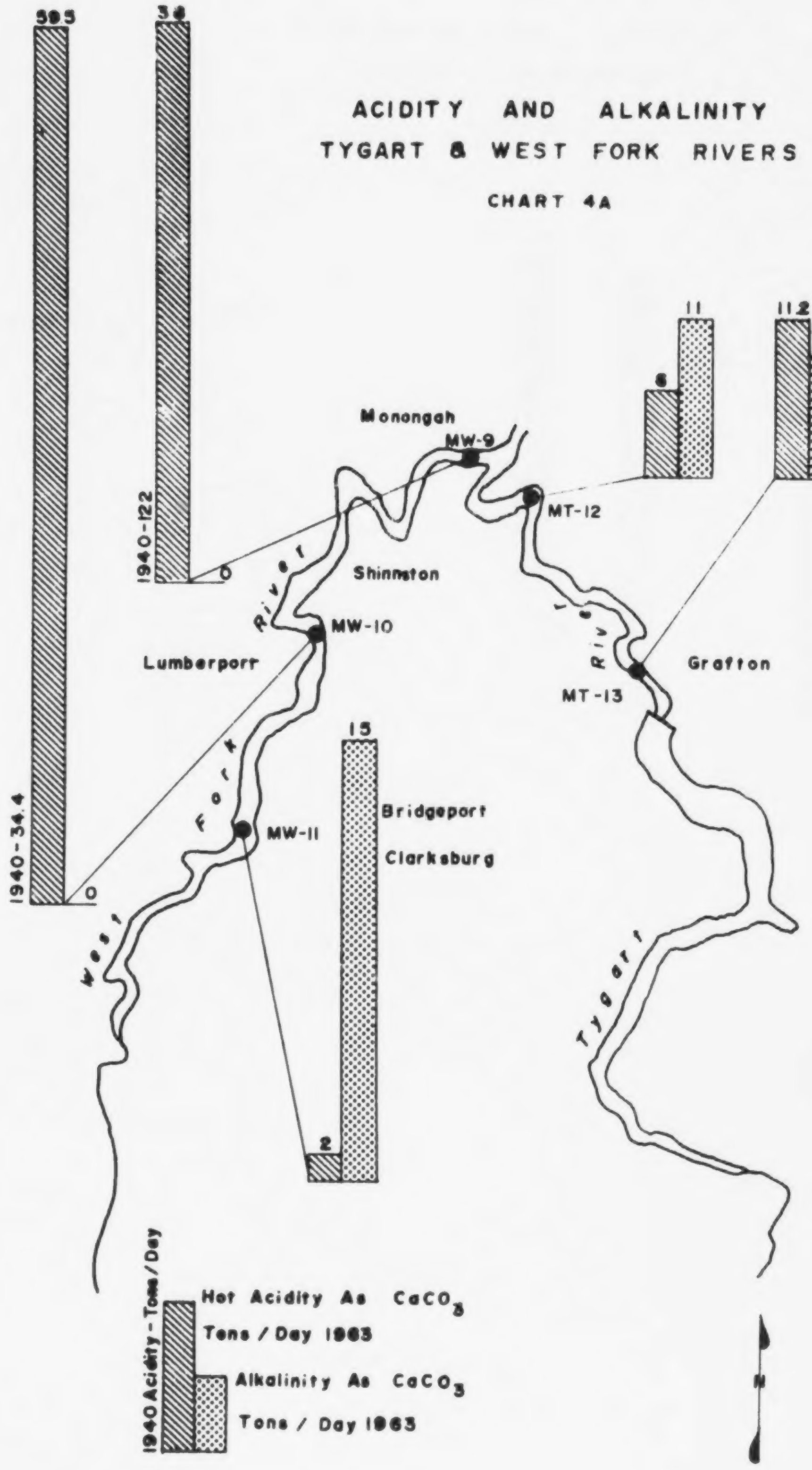
ACIDITY AND ALKALINITY
MONONGAHELA RIVER

CHART 4

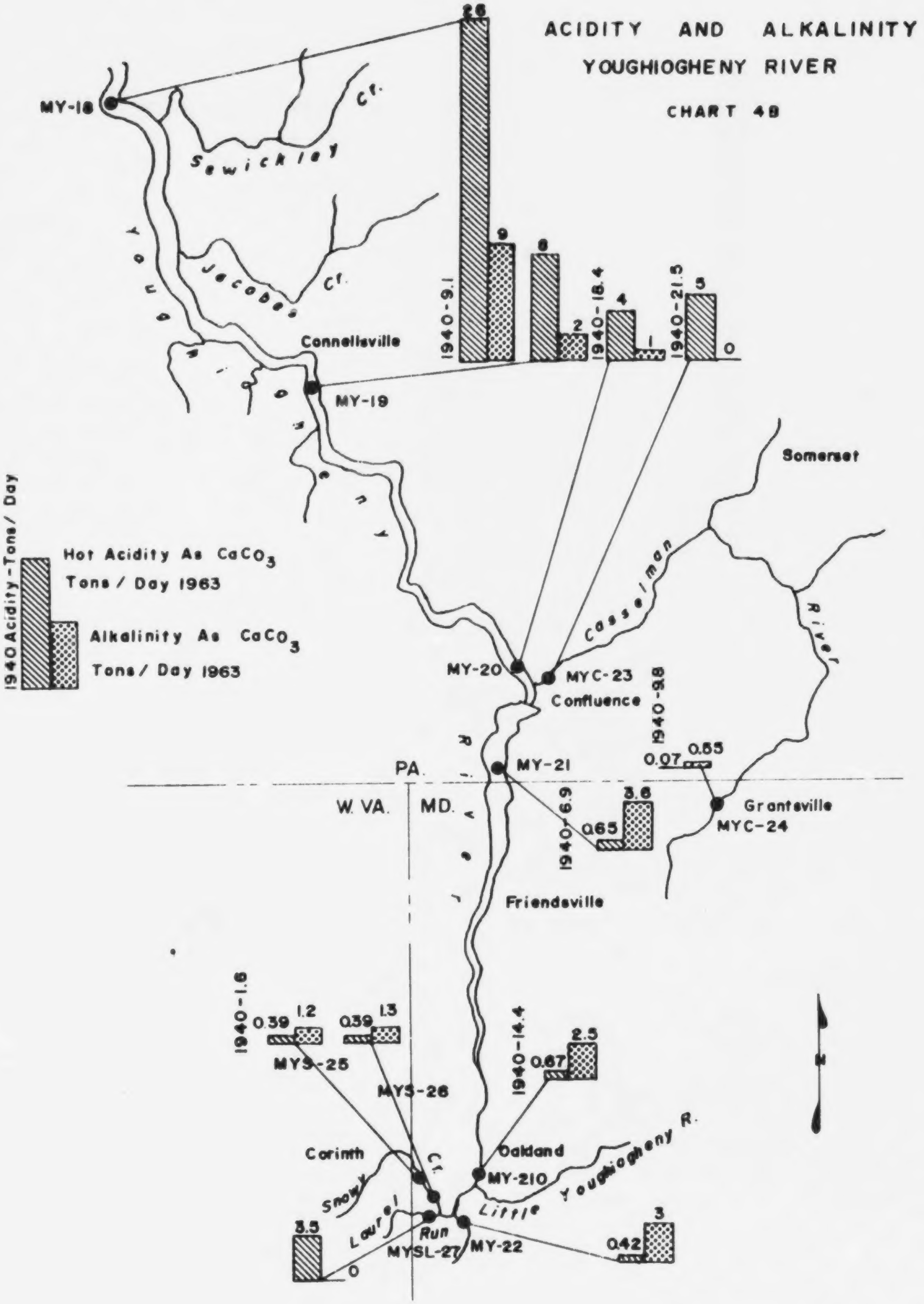

Allegheny Co. Line
Donora
Charleroi
M-1
Monessen
106
126
145
156
1940 - 267
0
1940 - 62
0
1940 - 84
0
1940 - 181
0
River
Greensboro
M-3
11
0
MD-7
67
Dunkard
Cr.
M-4
PA.
W. VA.
1940 - 228
17
Point Marion
M-5
Morgantown
Monongahela
1940 - 9.7
0
3.3
MB-8
M-6
Buffalo Cr.
Fairmont
N
1940 Acidity - Tons/Day
Hot Acidity As CaCO3
Tons/Day 1963
Alkalinity As CaCO3
Tons/Day 1963

ACIDITY AND ALKALINITY
TYGART & WEST FORK RIVERS

CHART 4A

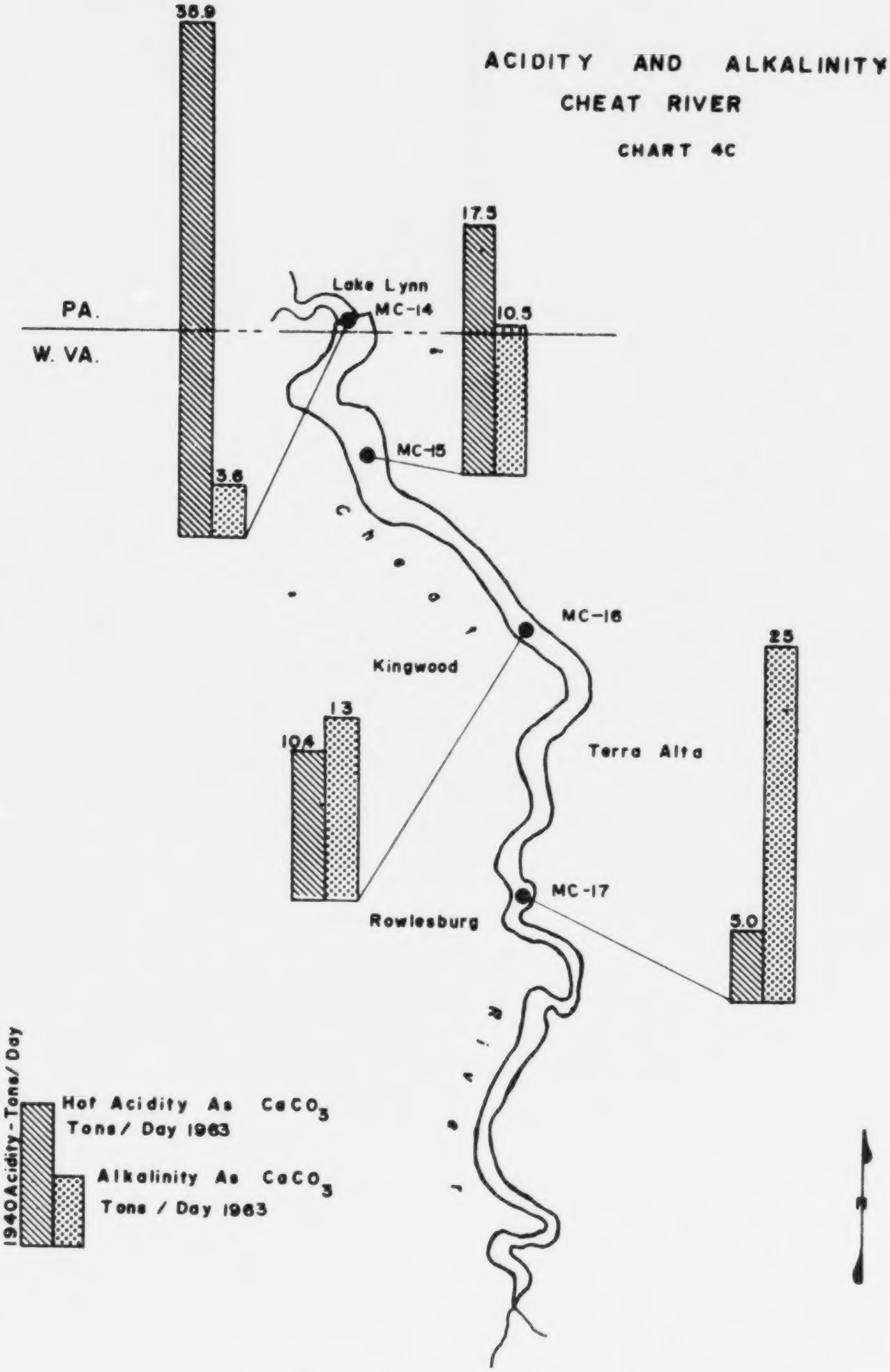

595
38
1940-122
0
1940-34.4
0
6
11
11.2
8.4
Monongah
MW-9
MT-12
Shinnston
MW-10
Lumberport
Grafton
MT-13
15
Bridgeport
Clarksburg
MW-11
2
West Fork River
Tygart River
1940 Acidity - Tons / Day
Net Acidity As $CaCO_3$
Tons / Day 1963
Alkalinity As $CaCO_3$
Tons / Day 1963
N

ACIDITY AND ALKALINITY
YOUGHIOGHENY RIVER
CHART 4B


MY-18
Sewickley Cr.
Jacobs Cr.
Youghiogheny River
Connellsville
MY-19
26
9
1940-9.1
8
2
1940-18.4
4
1
1940-21.5
5
0
Somerset
1940 Acidity-Tons/Day
Hot Acidity As $CaCO_3$ Tons/Day 1963
Alkalinity As $CaCO_3$ Tons/Day 1963
Casselman River
MY-20
MYC-23
Confluence
1940-9.8
0.07
0.55
PA.
W. VA.
MD.
MY-21
1940-6.9
0.65
3.6
Grantsville
MYC-24
Friendsville
1940-1.6
0.39
1.2
0.39
1.3
MYS-25
MYS-26
1940-14.4
0.67
2.5
N
Corinth
Snowy Cr.
Oakland
MY-210
Little Youghiogheny R.
Laurel Run
MYSL-27
MY-22
3.5
0
0.42
3

ACIDITY AND ALKALINITY
CHEAT RIVER

CHART 4C


38.9
3.6
Lake Lynn
MC-14
17.5
10.5
PA.
W. VA.
MC-15
Cheat River
MC-16
Kingwood
Terra Alta
13
10.4
25
5.0
MC-17
Rowlesburg
1940 Acidity - Tons/ Day
Hot Acidity As $CaCO_3$ Tons/ Day 1963
Alkalinity As $CaCO_3$ Tons / Day 1963

A. D. Sidio

This shows the mainstem of the Monongahela River from Fairmont down to the Charleroi station here indicated at M-1. At the Fairmont station there were 67 tons of acid per day present in the river and 17 tons of alkalinity.

As the stream progressed on down to Morgantown, it became an acid stream with 106 tons of acid per day and alkalinity. The load at the State line was 126 tons per day, 145 tons at Greensboro, and at Charleroi 156 tons.

This chart shows the West Fork and Tygart Rivers, which form the Monongahela at Fairmont.

The West Fork here at MW-10 indicates approximately 60 tons per day. There are 38 tons just above the confluence with the Tygart. The Tygart in here just above the confluence actually has more alkalinity than it does acidity.

Up here at Grafton, the stream is acid.

These figures on the side here indicate the values obtained with comparable flows in the 1940 study.

This one here (indicating) at the time of the study was 34.4.

This one here (indicating) was 122 at the time we got this study.

This one (indicating) comes into the State of

Maryland. This is the upstream station on the Youghiogheny. It is an alkaline stream at this point.

This (indicating) is Laurel Run, which is interstate between West Virginia and Maryland, and the same thing at Snowy Creek. At this point the Laurel Run watershed was contributing 3.5 tons of acid per day to the Youghiogheny.

Snowy Creek indicates that it was alkaline at the time of this study. I will point out something on that at a later time here in the report.

This (indicating) is the Cheat drainage area, which has its drainage area almost totally in the State of Pennsylvania. It does cross the State line at this point (indicating), and joins the Monongahela just a short distance down below the State line.

Up here at Rowlesburg you will notice the stream is quite alkaline. At this point the acidity is climbing up and the alkalinity is dropping.

The acidity at these two points downstream (indicating) shows that at the State line this is a very acid stream. This figure here is 35.9, or about 36 tons per day.

West Fork River

A. D. Sidio

The acid condition of the West Fork River has changed little since 1940. The problem of acid mine drainage in the West Fork River was recognized as early as 1930. During the years 1926 through 1929, hardness of the Clarksburg water supply averaged 53 mg/1 in 1926 to 66 mg/1 in 1929. In 1930 the average increased to 176 mg/1. During the 1963 survey the West Fork River at Clarksburg had an average hardness of 209 mg/1, indicating degradation since 1930.

I might say that the Clarksburg water plant averages show that during the entire year, or for the past year, they have had an average hardness of 222 milligrams per liter.

An increase in hardness increases the cost of treating water for domestic and industrial purposes.

Tygart River

The quality of the Tygart River appears to have deteriorated from 1940 to 1963. The pH values dropped from 6.8 in 1940 to less than 6.0 in 1963. This appears to be due to increased mining activity and possibly to the neglect of maintenance of mine sealing provisions.

A. D. Sidio

Cheat River

The Cheat River shows deterioration in quality during the 1940 to 1963 period. pH values in Lake Lynn dropped from 6.5 in 1940 to 5.1 in 1963, and from 6.1 to 4.5 below the reservoir. In 1940 the stream was found "... to be in good sanitary condition and shows little acidity." A 1929 Report of the Cheat River Basin by the West Virginia State Water Commission concludes in part,

> "... the amount of toxic wastes discharged during times of low flow is too much for the amount of diluting water and that if it continues to increase it will only be a matter of time before Cheat River will be unsuitable for industry, water supply, fish life, or recreation ... Lake Lynn is sufficiently alkaline this summer to support fish life ..."

That was in 1929. Cheat Dam forming Lake Lynn is right at the State line. During the 1963 survey the Cheat River, with the exception of the reach in the vicinity of Rowlesburg, was found to be free of desirable aquatic life necessary to support a fish population.

Youghiogheny River

The Youghiogheny River in some sections has shown improvement in acid conditions from 1940 to 1963. The particular section studied that indicated improvement in acid loads from 1940 to 1963 extends from Oakland, Maryland. to Confluence, Pennsylvania. pH values increased, and the section has changed from an acid to an alkaline stream.

The mainstem of the upper Youghiogheny is interstate between West Virginia and Maryland. No known sources of pollution enter the mainstem above the confluence with Snowy Creek, an interstate tributary. The pH values obtained by the Maryland Water Pollution Control Commission over a two-year period show the Youghiogheny to be about neutral (pH of 7.0) upstream of Snowy Creek. The August and September 1963 study indicated an average pH of 6.7 at this same point.

The Maryland data show a serious interstate problem between West Virginia and Maryland on the Laurel Run and Snowy Creek watersheds. This was confirmed by the findings of the 1963 survey. According to the Maryland data, Laurel Run, an interstate tributary, discharges 2,960 pounds of mineral acidity per day. (Maryland method for determining mineral acidity is to methyl purple endpoint.

See page 25 for "Total Potential Mineral Acidity," as determined in 1963 study.) Average values obtained during the 1963 study indicate a pH of 3.5 tons, or 7,000 pounds of total potential mineral acidity (to phenolphthalein-hot) per day being discharged by Laurel Run. Laurel Run is tributary to Snowy Creek just above the confluence of Snowy Creek with the Youghiogheny. Oakland, Maryland, uses the Youghiogheny as a source of water supply approximately three miles below its confluence with Snowy Creek.

The State of Maryland has requested the aid of West Virginia in cleaning up this upper section of the Youghiogheny. A proposal has been made to the West Virginia Water Resources Commission to use the Snowy Creek-Laurel Run as a "... pilot pollution control watershed program ..." The 1963 session of the West Virginia Legislature appropriated $20,000 for additional studies of the Snowy Creek-Laurel Run area.

The Youghiogheny is again interstate between Maryland and Pennsylvania. The State line runs through the Youghiogheny Reservoir. The Youghiogheny near the State line was alkaline. The alkalinity exceeded the acidity by three tons per day.

Casselman River

Casselman River, tributary to the Youghiogheny, is interstate between Maryland and Pennsylvania about three miles downstream of Grantsville, Maryland. The acid mine discharges to the upper reaches of the Casselman River did not detrimentally affect the condition of the river at the State line. Acid mine discharges to the Casselman in Pennsylvania causes deterioration of the stream.

Summary of Acid Findings

Of the 27 stations used during the 1963 study, water at 17 stations was acid, according to the definition used for this report. All stream points examined on the Monongahela were found to be acid, as indicated on Chart 4. The Youghiogheny River was an acid stream at the three downstream stations, and alkaline at Station MY-21 near the State line. The Cheat River was acid in the lower reach as it crosses the State line. Dunkard Creek was the most acid stream studied during the survey, with 858 mg/1 of acidity expressed in terms of calcium carbonate. Laurel Run was the only interstate stream that was acid in the upper reaches of the Youghiogheny during the study.

BIOLOGICAL CONDITIONS

A. D. Sidio

Stations for the biological study were selected to determine the effect of pollution on the animal and plant life in the river system. During this survey, no fishermen or signs of fishing activity were observed. Fish were observed in areas not polluted with acid mine drainage, but were not observed in severely degraded areas. Fish cannot tolerate water of low pH and are most commonly found in waters having a pH range from 5 to 9. Fish spawning could not take place in most degraded areas in the Monongahela Basin. There is a lack of fish food in these degraded areas and if fish migrated into them at various times of the year, the fish would starve or move out.

Bottom organisms indicate stream conditions over a long period of time. Therefore, the biologically degraded reaches show the effects of acid discharges both at other times and during the 1963 chemical survey.

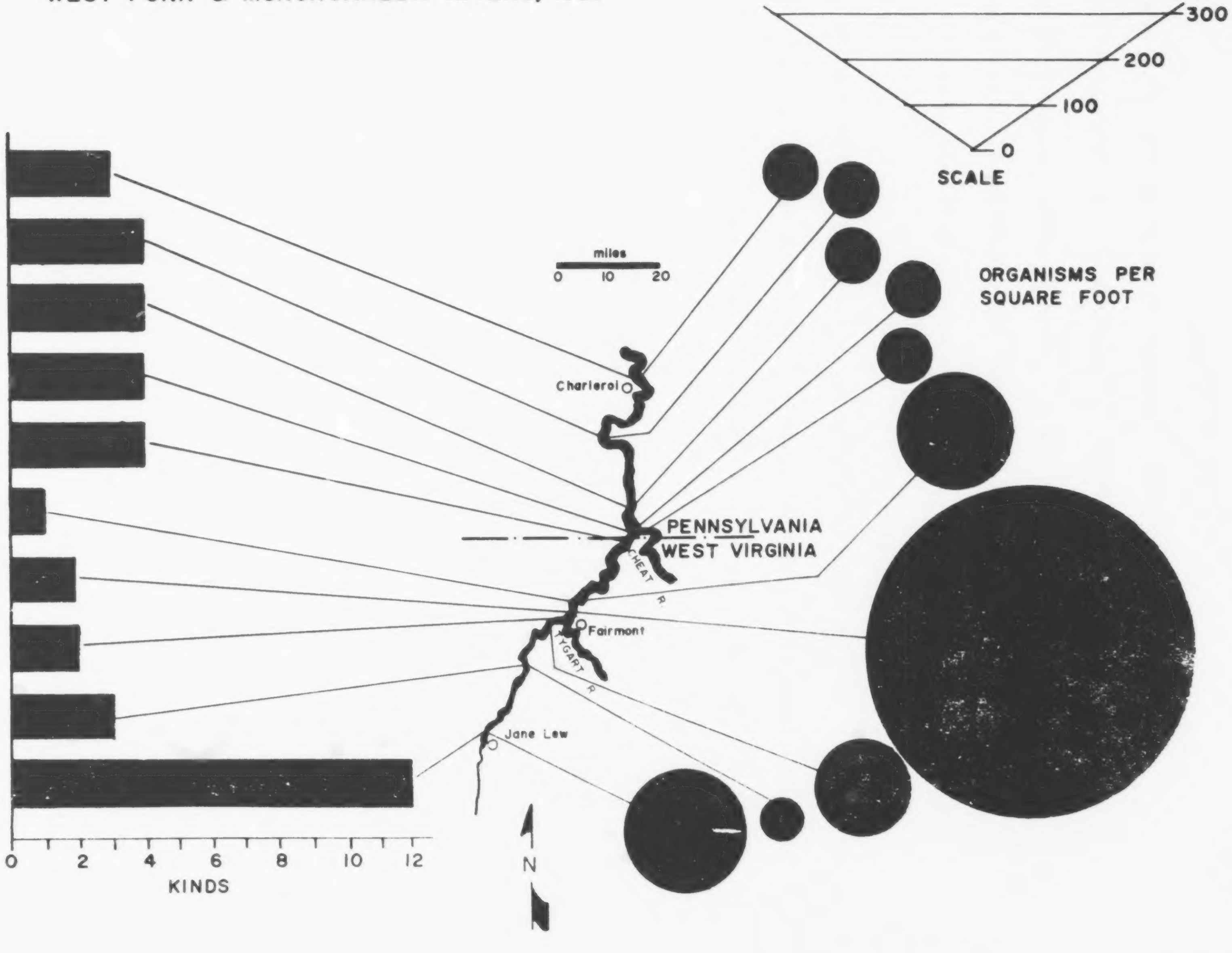
Bottom Studies

The West Fork and Monongahela Rivers

Bottom samples were collected and field observations made at stations from Jane Lew below Weston, West Virginia, to the vicinity of Charleroi, Pennsylvania, as indicated on Chart 5.

(Chart 5 is as follows:)

CHART 5. BOTTOM ORGANISM DATA—
WEST FORK & MONONGAHELA RIVERS, 1963



A. D. Sidio

Individual results found at each of the stations during the study are listed in Appendix B. At the first side road crossing below Jane Lew on the West Fork, many different kinds of bottom dwelling organisms were collected, indicating the suitability of the stream to support fish and other animal life.

The bars on this side of the chart indicate the number of kinds. The circles on this side indicate the organisms per square foot found in the river at that particular point.

For instance, at Jane Lew, there were twelve different kinds, and somewhere around one hundred organisms per square foot.

A healthy stream is denoted by many different kinds of bottom organisms, with few individuals representing each kind, principally because of the competition for food, space, and predation. The West Fork below Jane Lew is a healthy stream with a preponderance of clean-water-associated mayflies and caddisflies serving as fish food organisms.

Below Gypsy, West Virginia, and throughout the remainder of the stations sampled on the West Fork and Monongahela Rivers, the stream was degraded by acid mine pollution. The combined effects of acidity and the deposition of sediment caused by mine drainage resulted in a drastic decrease in the kinds and numbers of bottom organisms. At Jane Lew there were 12 different kinds found in the samples; at the State line and below, there were 4 or less, showing severely degraded conditions. At Jane Lew, the bottom organisms per square foot were twice the number found at the State line. Thus, degraded stream conditions were found in the vicinity of the State line and below.

Approximately one mile above the Highway 250 bridge at Fairmont, a large flow of mine drainage entered the West Fork River. Bottom samples both above and below this area revealed few organisms and few different kinds. A core sample of the silt layer near shore indicated a base of dark grey clay, over which was deposited 1-½ inches of sand and fine coal, 3/4 inch of light grey silt, and, on top, ½ inch of yellow flocculent material. Silt covers the natural stream bottom used as living areas by bottom organisms, and decreases the kinds and numbers of organisms that can live therein. The river bottom in the stream's central portion was composed of rubble and observed to be coated with iron oxide. It was devoid of life.

Just below Fairmont, on the Monongahela River, only very tolerant sludgeworms and midges were found, and the high sludgeworm population (255 per square foot) resulted from the discharge of sewage and organic wastes from Fairmont. In Buffalo Creek and in the Monongahela River, below its confluence with Buffalo Creek, coal washing operations made the water black and covered the bottom with fine particles of coal. Bottom sediments had an odor of coal and oil. These coal fines further reduced the bottom population, since most bottom organisms could not live in the environment.

Dunkard Creek, a tributary to the Monongahela River at Mile 87.1, was sampled one mile above its confluence. The bottom was covered with a three-inch layer of reddish-brown deposit, that supported many very tolerant midge larvae and little else. The stream was degraded. Much of the organic material to support the midge population was supplied by the extensive leaf litter lodged in the stream bottom; the stream is essentially covered with overhanging trees in the reach studied.

Without the sediments from acid mine drainage, the acidity and the coal fines from coal washeries, the Monongahela River would support a greater abundance of fish food organisms and a much more diversified population of bottom animals. Fish and fishing would be expected to increase proportionally to the food supply, since the fish population is directly related to available food supply.

A. D. Sidio

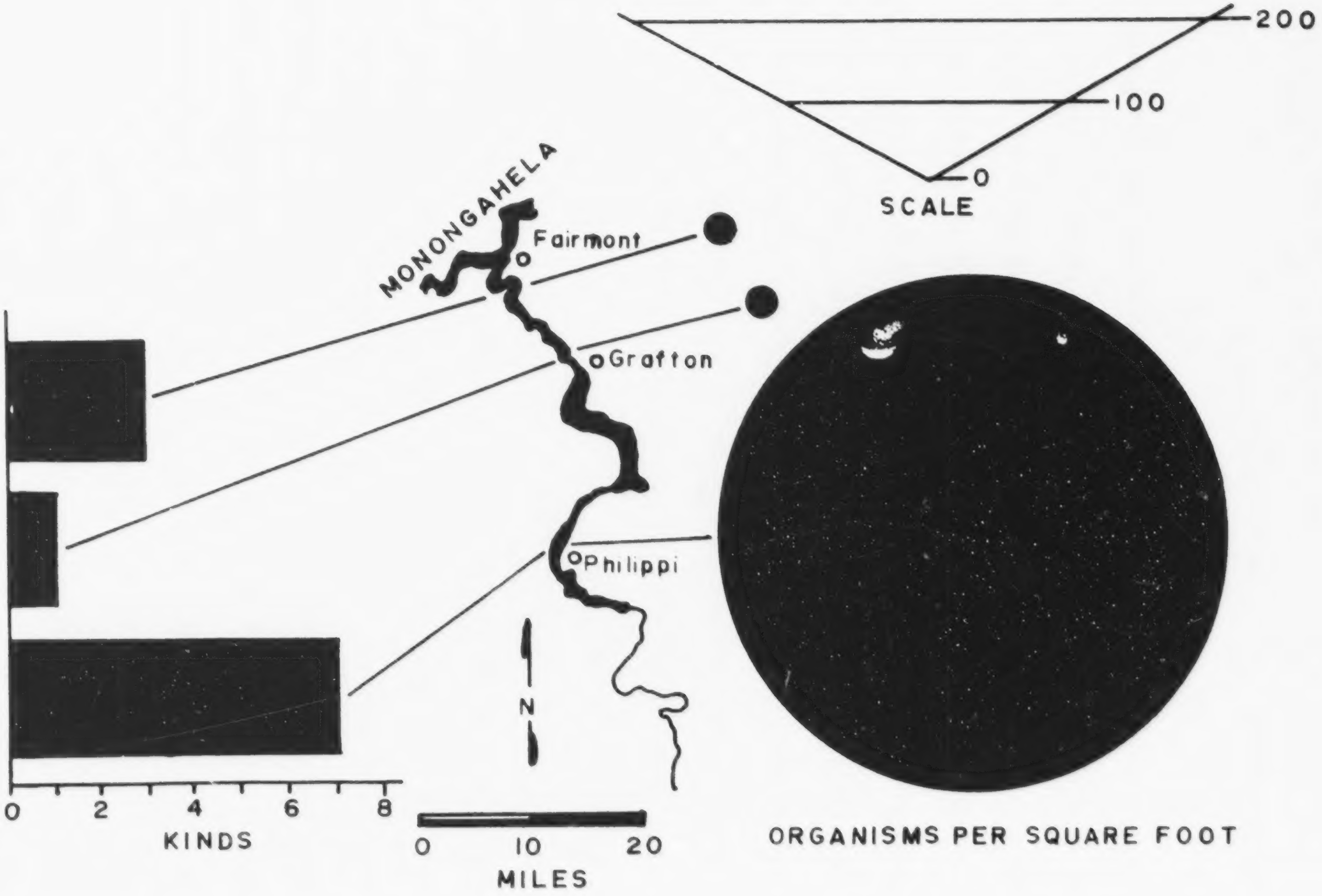
Tygart River

The Tygart River was examined as far upstream as Norton, West Virginia, 50 miles upstream of Tygart Reservoir Dam. At this point, acid drainage that forms a substantial portion of the Tygart River flow enters the stream from the right side (facing upstream). This colors the rocks and bottom red and destroys stream life. At Belington, some recovery was indicated by the presence of such fish food organisms as a few caddisflies, hellgrammites, and midges; however, the water was extremely clear and submerged rocks supported little life.

The Middle Fork tributary at Audra, West Virginia, had a population of bottom organisms that is typical of a healthy stream, with no indication of acid pollution. The Buckhannon River tributary at Rangoon showed effects of acid mine drainage. The rocks were slick, and were covered with an iron deposit. Stream organisms were present, but not in the quantity or diversity expected for the substratum.

(Chart 5-A is as follows:)

CHART 5A. BOTTOM ORGANISM DATA — TYGART RIVER, 1963



Quantitative samples (Chart 5A) were taken at Philippi, West Virginia, in a riffle area that supported seven different kinds of organisms and a total population of 171 organisms per square foot. No mayflies were observed, and there was evidence of an iron precipitate in some areas. The area could be classed as unbalanced, but not severely degraded. Just below Philippi a large coal washing operation discharges into the river, and substantial drainage from at least four mines in the area pollute the stream. Downstream at Arden, West Virginia, the rocks were brownish-red and no organisms could be found.

Downstream of the Tygart River Reservoir and below Grafton, the rocks were coated with a deposit of silt and algae that sloughed off readily on contact. Oil was noted on the surface of the water. The bottom population in this riffle area was reduced to only eight very tolerant sludgeworms per square foot, showing severe stream degradation. Little improvement was noted in the Tygart River just above its confluence with the Monongahela at Fairmont. Only six organisms per square foot were found, and these were represented by three tolerant species. These lower reaches of the Tygart River are severely polluted with acid mine drainage.

Cheat River

The Cheat River is formed by Shavers Fork and Blackwater River above Parsons, West Virginia. In Shavers Fork, a total of 13 different kinds of organisms, including those normally found only in clean, healthy streams, was collected. The rocks in Blackwater River, on the other hand, were coated with red silt and a tolerant algae, and contained no bottom organisms, indicating pollution from acid mine drainage.

Below Parsons, west Virginia, no bottom organisms were found. Some stream recovery was shown by the bottom organisms at Rowlesburg, as indicated in Appendix B, but at Albright severely degraded bottom conditions supported only an occasional organism. These conditions persisted across the State line to the confluence with the Monongahela River.

Below Lake Lynn and above its confluence with the Monongahela River, the Cheat River receives additional wastes from a coal washing operation and several acid mine discharges in Pennsylvania.

Youghiogheny River

Bottom samples from the Youghiogheny River near Oakland, Maryland, on Mansfield Road, in a riffle area, yielded five different kinds of organisms, including those forms normally associated with a healthy stream. Below this point, the river receives the Snowy Creek tributary.

Below the entrance of Snowy Creek, near the Oakland Bridge, five different kinds of organisms were found, but unlike the upstream stations, those fish food organisms normally associated with a healthy stream were either much reduced, or eliminated, and were replaced by tolerant sludgeworms and midges. Thus, an adverse effect of Snowy Creek and Laurel Run on the Youghiogheny River was demonstrated by degraded conditions.

(Charts 5B and 5C are as follows:)

CHART 5B. BOTTOM ORGANISM DATA — CHEAT RIVER, 1963

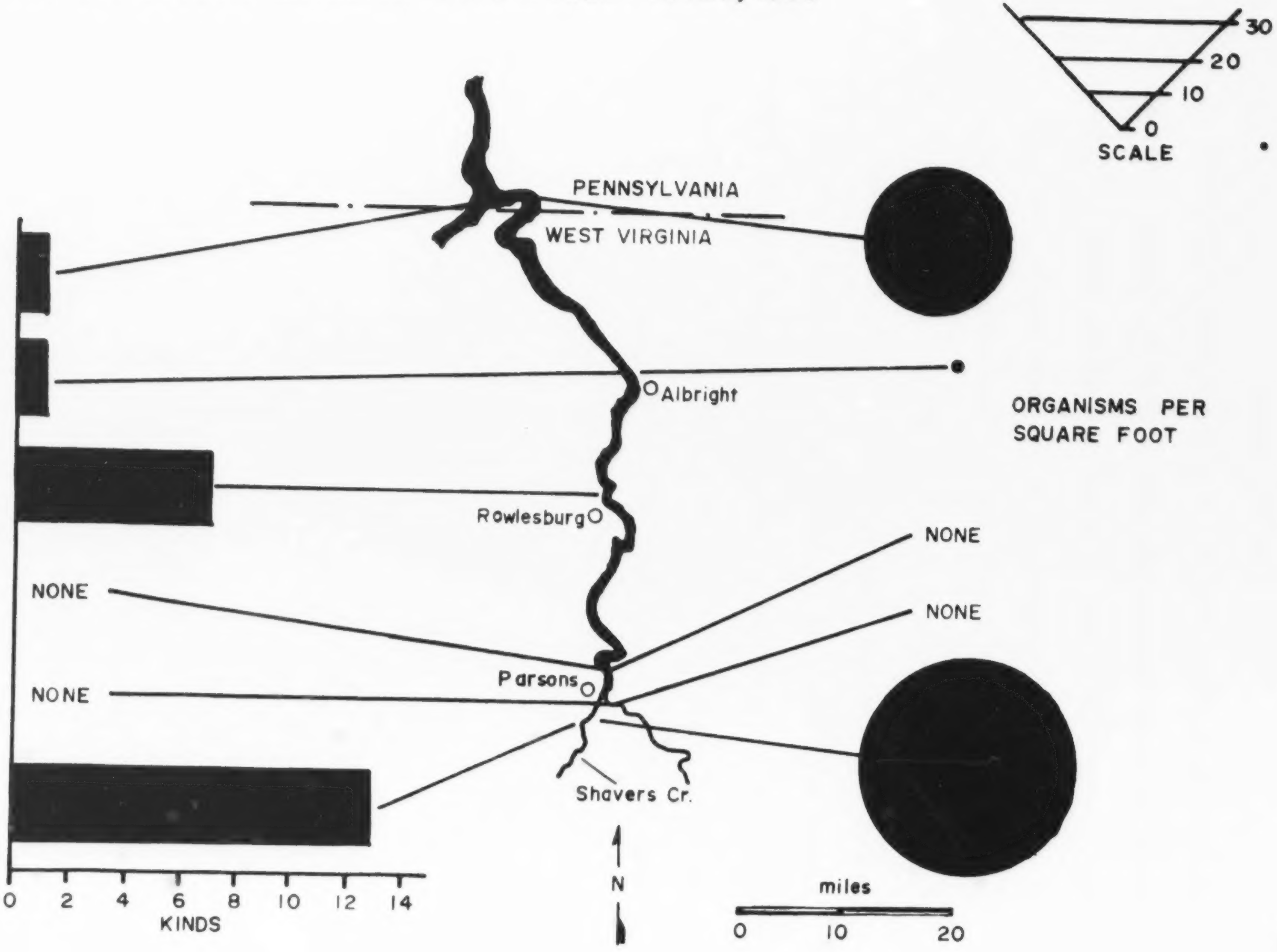
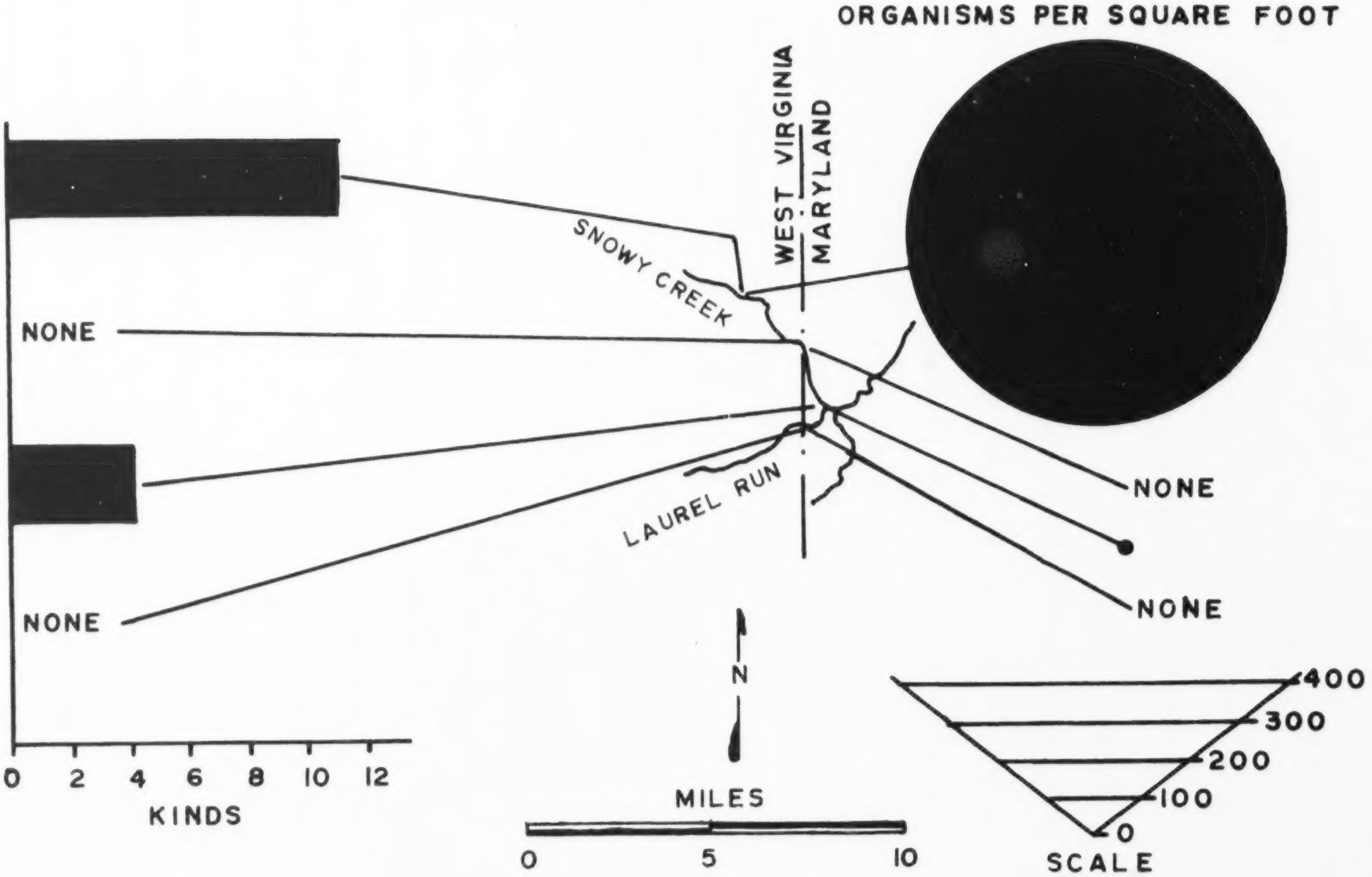

30
20
10
0
SCALE
PENNSYLVANIA
WEST VIRGINIA
Albright
ORGANISMS PER
SQUARE FOOT
Rowlesburg
NONE
NONE
NONE
NONE
Parsons
Shavers Cr.
N
miles
0
10
20
0
2
4
6
8
10
12
14
KINDS

CHART 5C. BOTTOM ORGANISM DATA — SNOWY CREEK, 1963


ORGANISMS PER SQUARE FOOT
WEST VIRGINIA
MARYLAND
SNOWY CREEK
LAUREL RUN
NONE
NONE
NONE
NONE
N
0
2
4
6
8
10
12
KINDS
MILES
0
5
10
400
300
200
100
0
SCALE

Snowy Creek, as indicated on Chart 5C, below the water intake of Hopemont Sanitarium, West Virginia, in a riffle area, contained 11 different kinds of organisms and a total population of 372 organisms per square foot. This represents a healthy stream and a habitat suitable for normal aquatic life. A short distance downstream just above the State line the rocks in the stream bottom were red and no bottom organisms were found either on the rocks or in the mud banks. Biological degradation in the vicinity of the State line showed that the stream was polluted with acid mine drainage. Downstream at Crelling, Maryland, only slight recovery had taken place as shown by stream organisms.

The 1963 chemical data do not show Snowy Creek to be acid during the study period. However, data provided by the State of Maryland indicate the stream becomes acid during and following periods of rainfall. The biological findings show the degraded condition of Snowy Creek caused by the acid discharges during and after rainfall periods.

Laurel Run, an interstate tributary of Snowy Creek, was also examined in the vicinity of Crellin, Maryland. No animal life could be found, indicating that this stream is severely degraded by acid mine drainage in the vicinity of the State line, and its usefulness is destroyed for any purpose.

The Youghiogheny River at Friendsville, Maryland, was a healthy stream. A similar situation was encountered below the dam at Confluence, Pennsylvania. Seven-tenths of a mile below the junction of severely degraded Casselman River, in Pennsylvania, no bottom organisms were found and the rocks were coated with a thick, gelatinous material.

Some stream recovery occurred in the Youghiogheny River as shown by the bottom organisms at Connellsville, Pennsylvania, but above Sutersville acid mine pollution was again indicated by the absence of bottom life.

Bottom samples taken on Casselman River at Grantsville, Maryland, revealed an abundance of caddisfly larvae indicative of healthy conditions for the physical stream environment. Four-tenths of a mile below the State line in Pennsylvania, the stream receives acid mine drainage, but bottom organisms indicate recovery at the next town road crossing. At Salisbury, Pennsylvania (RM 44), bottom organisms again indicated a healthy stream. At Boynton (RM 43) and again at Meyersdale (RM 34), Pennsylvania, Casselman River receives substantial contributions of mine drainage, as shown by the absence of bottom organisms, and rocks covered with a brownish-red deposit. At Rockwood (RM 22), the rocks were red and supported no life. Just prior to its confluence with the Youghioghery River an iron precipitate was present on the rocks, which were slick, relatively free of silt and algae, and supported no organisms.

Algal Studies

Algal counts were made at 15 locations in the Monongahela River Basin, as indicated on Charts 6 and 6A.

(Charts 6 and 6A are as follows:)

CHART 6. PLANKTON DATA — MONONGAHELA, TYGART AND CHEAT RIVERS

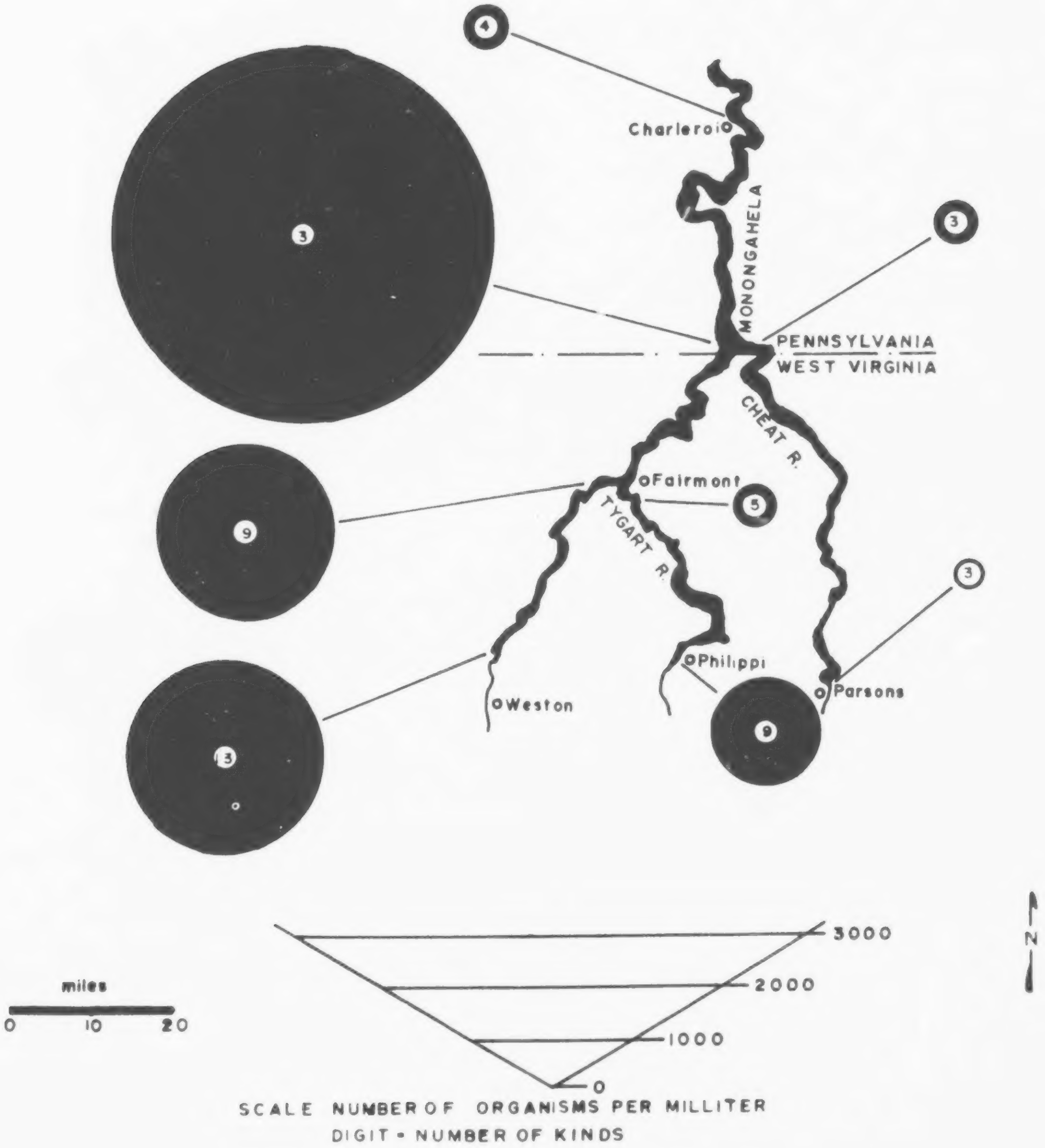
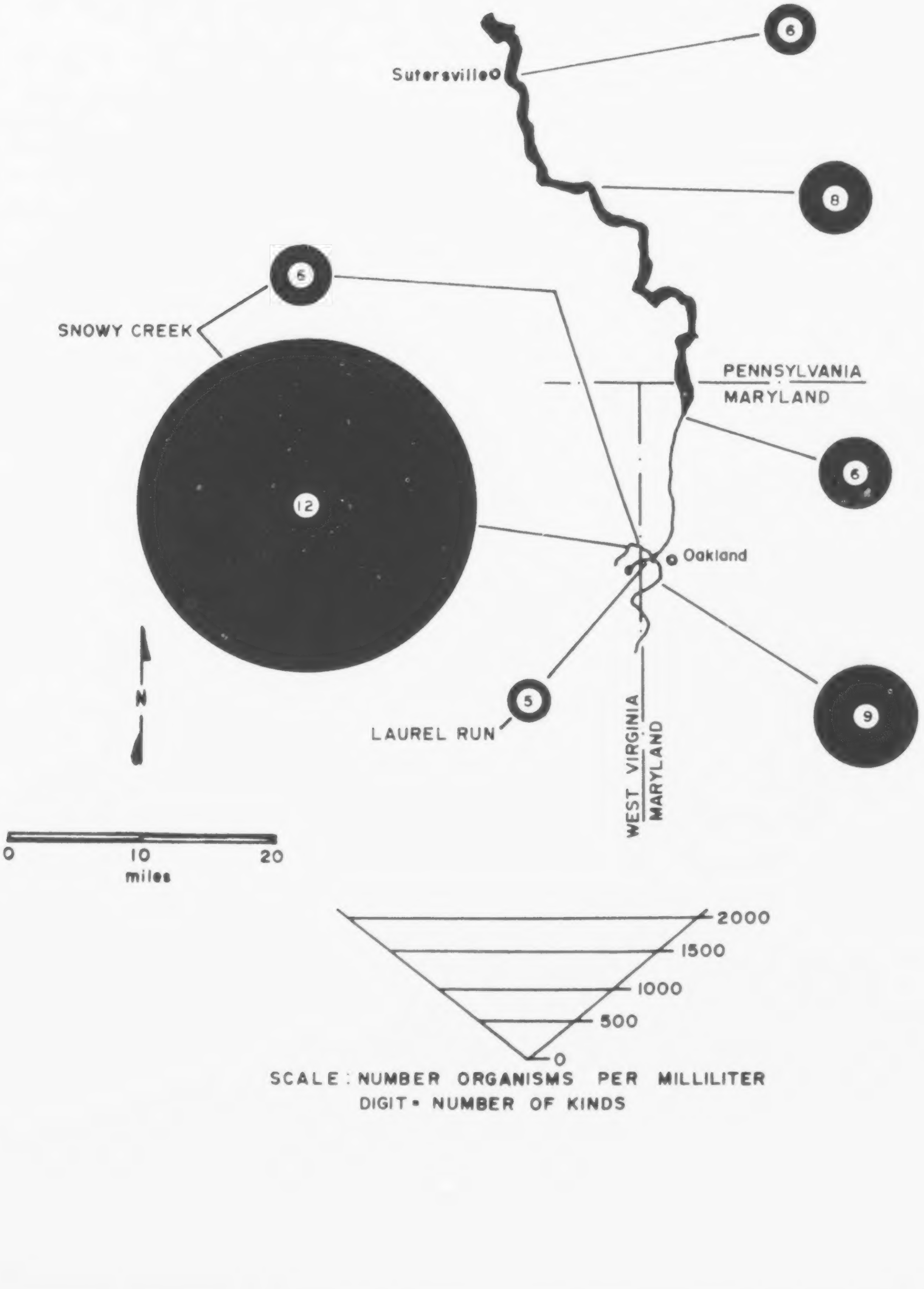

4
Charleroi
3
MONONGAHELA
3
PENNSYLVANIA
WEST VIRGINIA
CHEAT R.
oFairmont
9
5
TYGART R.
3
oPhilippi
oParsons
oWeston
13
9
3000
2000
1000
0
N
miles
0
10
20
SCALE NUMBER OF ORGANISMS PER MILLITER
DIGIT = NUMBER OF KINDS

CHART 6A. . PLANKTON DATA: YOUGHIOGHENY RIVER


6
Sutersville
8
6
SNOWY CREEK
PENNSYLVANIA
MARYLAND
6
12
Oakland
N
5
LAUREL RUN
9
WEST VIRGINIA
MARYLAND
0
10
20
miles
2000
1500
1000
500
0

SCALE: NUMBER ORGANISMS PER MILLILITER
DIGIT = NUMBER OF KINDS

These counts confirm the findings as indicated by the bottom organisms populations. In areas polluted with acid mine drainage, the number of different kinds and the total population are substantially reduced compared to non-polluted or lesser polluted areas. Algae are an important link in the aquatic food chain furnishing food for certain bottom organisms and fish. When algae cannot develop, other aquatic organisms that might be able to tolerate local conditions are deprived of a natural food supply.

BACTERIOLOGICAL CONDITIONS

The individual results obtained by coliform and fecal streptococcus determinations are recorded in Appendix C. The membrane filter technique was used in determining both coliform and fecal streptococci densities.

The Ohio River Valley Water Sanitation Commission considers waters with an average of less than 5,000 coliform per 100 ml satisfactory for use as a raw water supply; for bathing or swimming waters, average coliform organisms should not exceed an average of 1,000 per 100 ml; and for non-bathing or non-swimming waters, the Commission's bacterial quality objective is an average of not more than 5,000 coliforms during any month of the recreational season. As member States of the Commission, Pennsylvania and West Virginia use these objectives in their pollution control program.

Coliform and fecal streptococci densities determined on the mainstem of the Monongahela during the 1963 studies generally were low and reflect the inhibiting action of the acid conditions in the stream on these pollution indicator organisms.

Coliform levels in excess of 5,000 per 100 ml were found at two points of interstate concern. The sampling station (MYS-25) on Snowy Creek at Corinth, West Virginia, near the Maryland State line, had an average coliform count of 12,700 per 100 ml. The coliform count on the Casselman River at Grantsville averaged 88,700 per 100 ml.

The Youghiogheny Reservoir at the U. S. Highway 40 bridge (MY-21) just downstream of the Maryland-Pennsylvania State line had an average coliform count of 4,060 per 100 ml. This reservoir is used extensively for recreational purposes.

The December 1962 Pennsylvania Department of Health, Division of Sanitary Engineering Report to the Sanitary Water Board states that 78,800 people discharge sewage to the Monongahela between the West Virginia State line and the Allegheny County line. The report also states:

> "These wastes create public health hazards and nuisances at the sewer outfalls and adversely affect beneficial uses of the river."

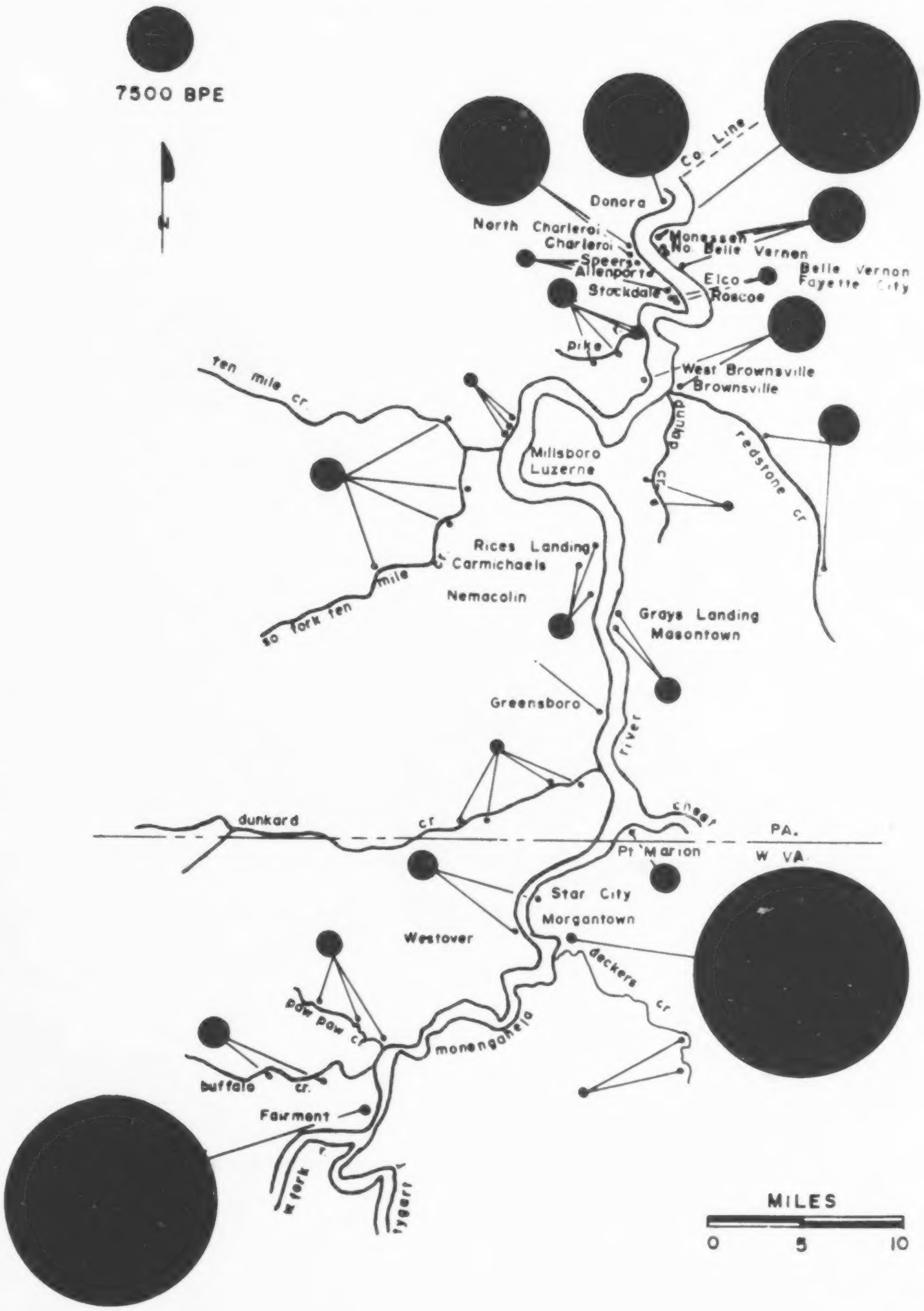
The inhibiting effect of acid conditions on bacteria is demonstrated by an examination of the results obtained at stations MD-7 on Dunkard Creek, and at MB-8 on Buffalo Creek. Both of these streams receive sewage discharges. Dunkard Creek, just upstream of its confluence with the Monongahela, was quite acid with an average pH of 2.8. Coliform and fecal streptococci bacteria were virtually absent in Dunkard Creek. Buffalo Creek, with an average pH of 7.2, had an average coliform density of over 200,000 per 100 ml, and a fecal streptococci density of 6,500 per 100 ml.

As pH values increase toward the neutral point, there is less inhibition of intestinal bacteria. At Monongah, West Virginia, on August 30 with a pH of 4.1, the coliform and fecal streptococci levels were less than 100 and less than 2 per 100 ml respectively. At this same station, on September 5, with a pH of 5.4 the bacterial densities increased to 23,000 coliform, and 50,000 streptococci per 100 ml.

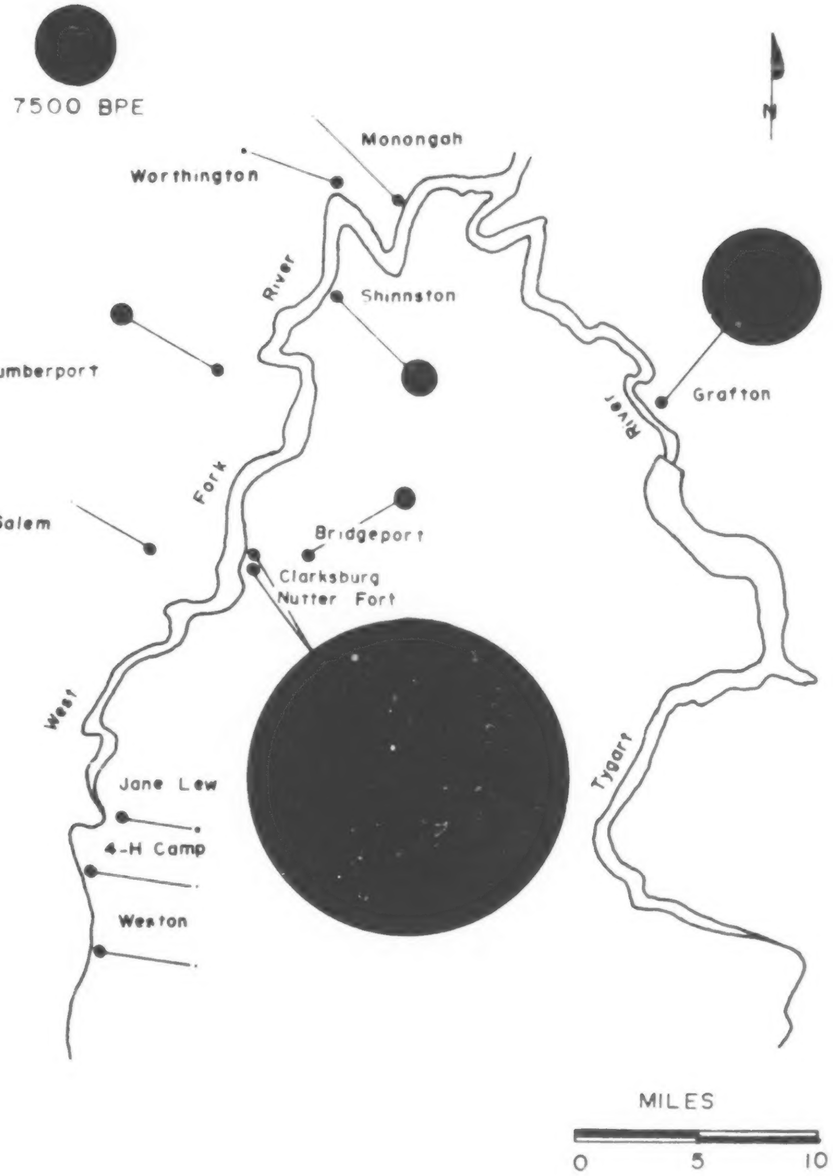
Calculations of estimated coliform bacteria densities have been made on the Monongahela to determine what levels might be expected to occur when pH values are increased through a reduction of acid wastes, or acid concentrations lowered by increased stream flow. Only municipal sewage discharges were considered as sources of bacterial contamination.

(Charts 7, 7A, 7B and 7C are as follows:)

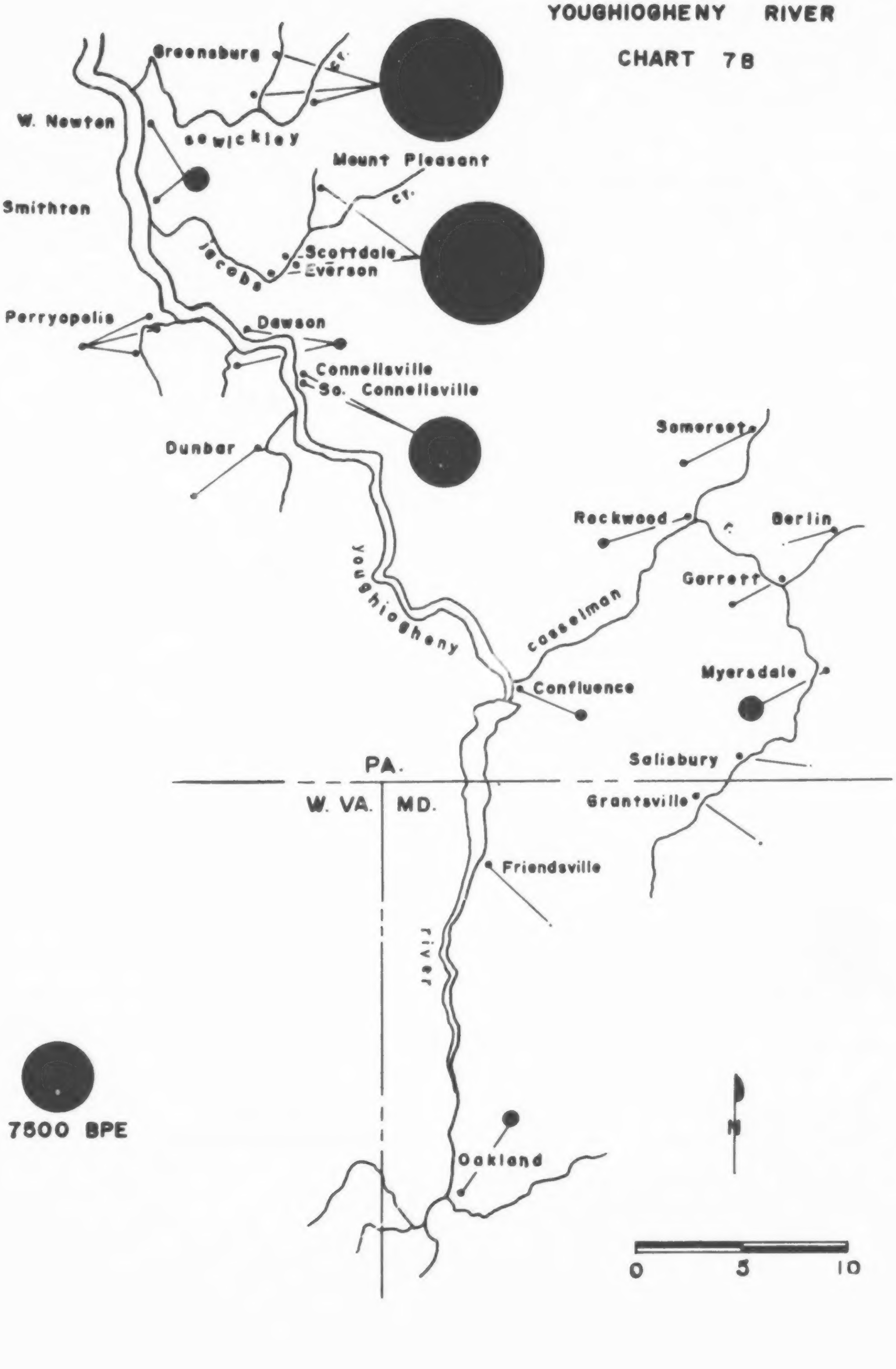
SOURCES OF BACTERIAL POLLUTION
MONONGAHELA RIVER
CHART 7


7500 BPE
N
Co Line
Donora
North Charleroi
Charleroi
Speers
Allenport
Stockdale
Monessen
No Belle Vernon
Belle Vernon
Fayette City
Elco
Roscoe
pike
West Brownsville
Brownsville
ten mile cr.
dunlap cr.
redstone cr.
Millsboro
Luzerne
Rices Landing
Carmichaels
so fork ten mile cr.
Nemacolin
Grays Landing
Masontown
Greensboro
river
dunkard cr.
cheat
PA.
W VA.
Pt Marion
Star City
Morgantown
Westover
deckers cr.
paw paw cr.
buffalo cr.
monongahela
Fairment
w fork r.
tygart
MILES
0
5
10

SOURCES OF BACTERIAL POLLUTION
TYGART AND WEST FORK RIVERS
CHART 7A


7500 BPE
N
Monongah
Worthington
River
Shinnston
Lumberport
Grafton
River
Fork
Salem
Bridgeport
Clarksburg
Nutter Fort
West
Tygart
Jane Lew
4-H Camp
Weston
MILES
0
5
10

SOURCES OF BACTERIAL POLLUTION
YOUGHIOGHENY RIVER
CHART 78


Greensburg
cr.
W. Newton
sewickley
Mount Pleasant
Smithton
cr.
Jacobs
Scottdale
Everson
Perryopolis
Dawson
Connellsville
So. Connellsville
Dunbar
Somerset
Rockwood
Berlin
Garrett
Youghiogheny
casselman
Confluence
Myersdale
Salisbury
PA.
W. VA.
MD.
Grantsville
Friendsville
river
7500 BPE
N
Oakland
0
5
10

SOURCES OF BACTERIAL POLLUTION
CHEAT RIVER
CHART 7C

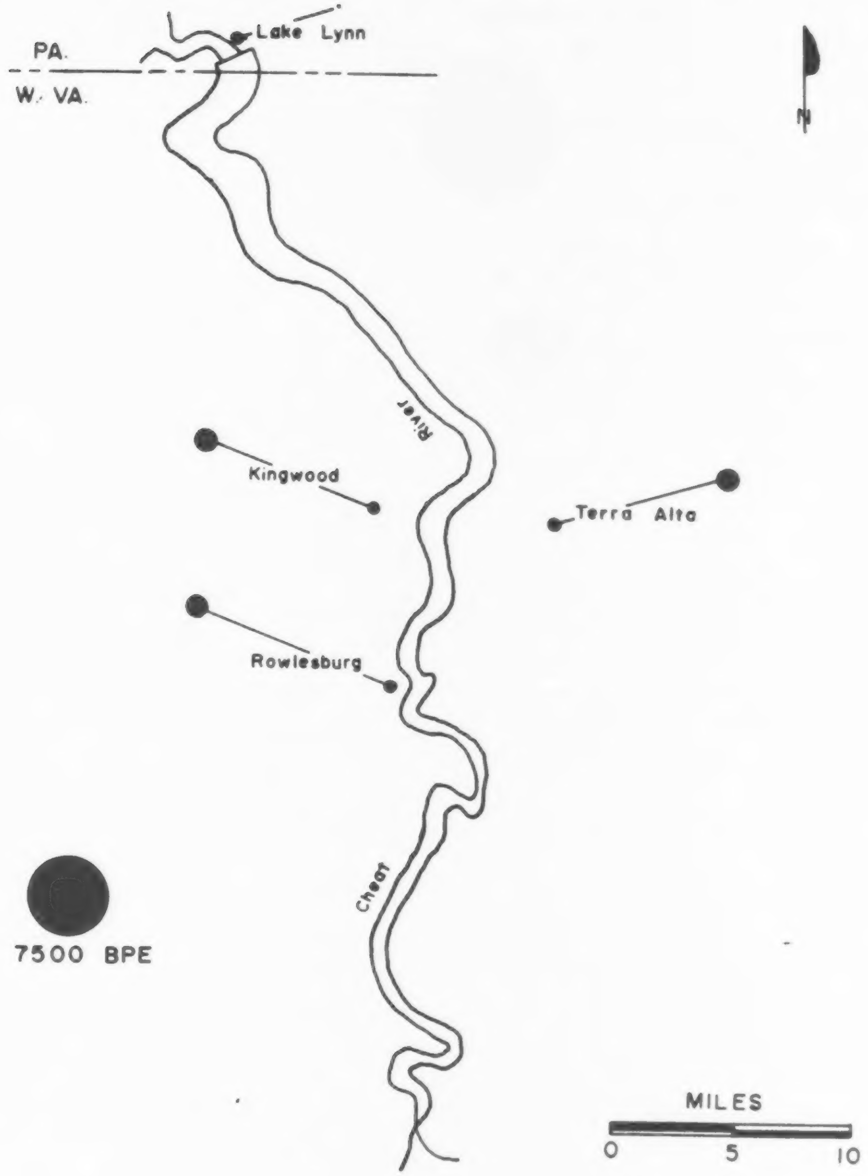

Lake Lynn
PA.
W. VA.
N
River
Kingwood
Terra Alta
Rowlesburg
Cheat
7500 BPE
MILES
0
5
10

Chart 7 is the mainstem of the Monongahela from about Fairmont down to the Allegheny County line, or right down here around the Fork.

In the circle the diameter indicates 7,500 bacterial population equivalent being discharged into the stream. The sizes of these balloons indicate the quantity of waste being discharged from Fairmont, in this case (indicating) from Morgantown, from Point Marion in Pennsylvania. These two below here (indicating) represent both Star City and Westover.

This is the chart on the Tygart and West Fork Rivers, showing Clarksburg and Nutter Fort at this point, and the relative population, and the bacterial population equivalent being discharged by each of these communities. In this case here, for Clarksburg and Nutter Fort together, they represent a rather large portion of the bacterial load being discharged there.

Chart 7B is a chart of the Youghiogheny Basin down through the Allegheny County area. The balloons show the relative size of the community discharging waste into the stream.

Here in Maryland you have Oakland, Grantsville, where partial treatment is provided, and Friendsville, all of these being relatively small communities.

A. D. Sidio

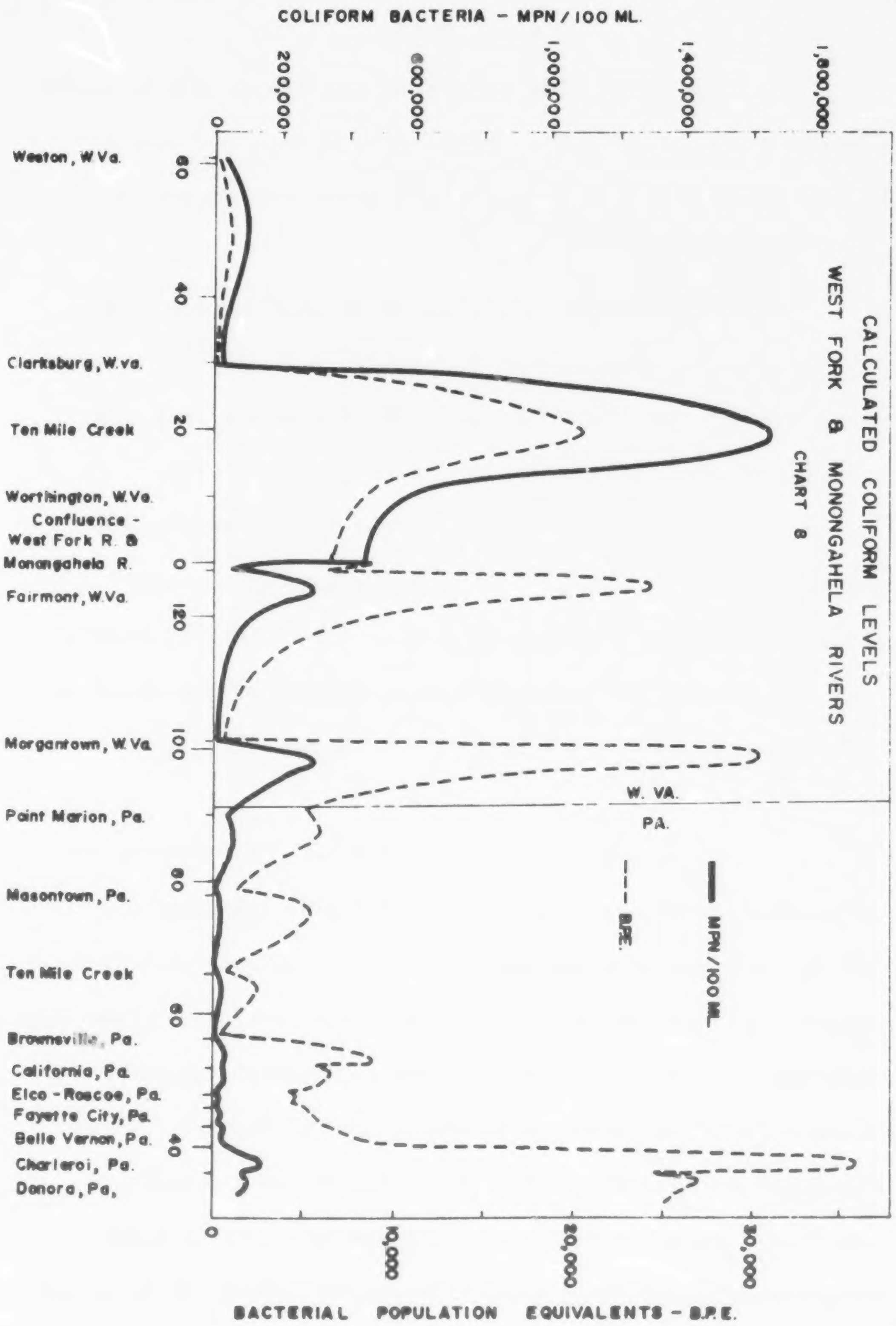
These are some of the communities (indicating) in the State of Pennsylvania.

Chart 7C is the Cheat River Basin, with relatively a small quantity of domestic waste from Rowlesburg. We have Kingwood in the West Virginia area, and also the Lake Lynn, Pennsylvania area.

Charts 7, 7A, 7B and 7C depict the sewered population discharged by each of the municipalities in the basin. With sewered population figures and stream flows available, coliform bacteria densities in non-acid streams can be estimated. The estimated values may be expected to occur should increased flow temporarily eliminate the acid conditions of the stream, or should the acid discharges be reduced at their sources.

Estimated coliform bacteria levels for the West Fork and the Monongahela Rivers are included in Appendix C. The determinations were made on the basis of a 30 percent flow (that flow that will be exceeded 70 percent of the time). These calculated estimates are indicated on Chart 8.

(The chart referred to is as follows:)



CALCULATED COLIFORM LEVELS
WEST FORK & MONONGAHELA RIVERS
CHART 8

A. D. Sidio

The solid line indicates the MPN or the coliform number, the most probable number of coliform per 100 ml at the various points in the river below the source of waste.

Here are the municipalities discharging waste directly to the Monongahela or West Fork, which are listed, and these are the number of coliform organisms that are calculated for that particular point in the river.

As indicated by the chart, high coliform counts may be expected to occur at points below the sources of sewage discharge. At the State line the estimated density from all sources of upstream municipal discharges would be approximately 70,000 coliform bacteria per 100 ml, or about 47 coliforms per drop.

At no point between Weston and Fairmont do the calculated estimates drop below the 5,000 coliform per 100 ml, recommended maximum for use as a source of water supply. Clarksburg and Spelter withdraw water supplies from this reach. Below Clarksburg, the calculated estimate indicates a coliform level in excess of 1,650,000 per 100 ml. The coliform densities in West Virginia, as indicated by the chart, range from 7,100 coliforms per 100 ml above Morgantown to the high below Clarksburg. This is from 1.4 to 350 times the recommended level for use as a source of water supply or for general recreation. The estimates range up to 1,650 times those recommended for water contact sports.

In Pennsylvania, the increased flow decreases the coliform bacteria density. Because of the large scale of Chart 8, the values in Pennsylvania appear to be low. However, densities in excess of 148,000 per 100 ml were estimated below Charleroi. Densities between the State line and the Allegheny County line at the peaks below sources of sewage vary from 10,500 to the high below Charleroi. At several points the values dropped below the 5,000 per 100 ml, but at no point did the densities drop to 1,000 per 100 ml.

Values in excess of 5,000 coliform per 100 ml present a potential health hazard to water supplies, and general recreational uses. Values in excess of 1,000 coliform per 100 ml present a health hazard where work or recreational activities require contact with or ingestion of the water. Sewage discharged to the Monongahela River by Morgantown and Westover, West Virginia, contribute to the health hazards indicated in Pennsylvania.

DISSOLVED OXYGEN (DO)

Dissolved oxygen values observed during the 1963 survey were at acceptable levels at all points on the main streams. The lowest average value on the Monongahela was 7.0 milligrams per liter (mg/l) below Fairmont. The lowest value on the main streams was 5.65 mg/l in the West Fork River at Gypsy. The DO at all stations located near the State lines was at acceptable levels during the two-week sampling period.

The 1959 Ohio River Valley Water Sanitation Commission Report includes calculated values of dissolved oxygen that would be expected to occur downstream of organic waste discharges under low flow, high temperature conditions on the West Fork and Monongahela Rivers. Low flow conditions considered were the one percent flow, or that flow that would be exceeded 99 percent of the time. Deoxygenation and reoxygenation coefficient rates found under non-acid conditions were used. The results of these calculations showed that without a high degree of treatment at Weston and Clarksburg, the dissolved oxygen in the West Fork River would be completely depleted.

The results of the calculations further indicated that with a minimum degree of treatment of all other sources of waste on the Monongahela, the dissolved oxygen levels would be maintained at acceptable levels in the reach considered in this report, assuming that the DO in the West Fork was not depleted. The Commission considers minimum treatment to be substantially complete removal of settleable solids and removal of not less than 45 percent of the total suspended solids.

MONETARY DAMAGES

The reach of the Monongahela River studied during 1963 was limited to the Allegheny County line. Sampling of the river did not extend downstream of Charleroi, Pennsylvania. When estimating damages to uses caused by the acid conditions of the stream the downstream uses must also be considered. Damages were calculated for those that occur in the Monongahela to its mouth at Pittsburgh. It is not intended to indicate that damages due to the acid contribution to the Ohio River by the Monongahela stop at Pittsburgh. The 1943 Public Health Service Report indicated damages to the extent of $2,071,000 for the year 1940 upstream of the Ohio-West Virginia-Pennsylvania State line. The Monongahela River System contributed 60 percent of the acid load above the three State lines in 1940, and contributed significantly to damages occurring in the upper reaches of the Ohio River.

The damages considered here are limited to those caused by acid mine drainage and to those that permit estimation in dollars. No effort has been made to place a value on the damages to recreation, nuisance conditions, and public health hazards that are real, and are of equal or greater significance than those listed, but are intangible.

Physical damages to those facilities for which information is presently available are the only ones considered. The losses do not include damages to intake structures and conveyance facilities, pumps, highway structures, the added expense of providing acid-resistant facilities, or the damages to mining operations.

Industrial and municipal uses of the Monongahela were obtained from data collected by a survey conducted by the Pennsylvania Department of Health, Sanitary Engineering Division, in cooperation with the U. S. Public Health Service in 1961. Calculations were based on an industrial use of 1,600 mgd requiring neutralization only and 25 mgd requiring softening. Municipal use was based on 94 mgd requiring both neutralization and softening. Data on damages to boats, barges, and lock and dam structures were obtained from the Corps of Engineers, Pittsburgh Office.

The following table lists the damages for those items that can readily be estimated.

Annual Damages Due to Acid Conditions of the Monongahela River

	Annual Damages
Industrial Water Supplies	$1,220,000
Domestic Water Supplies	154,000
Boats	354,000
Barges	483,000
Lock and Dam Structures	40,000
Total	$2,251,000

The damages not considered in the above figures in all probability equal or exceed those listed.

SUMMARY AND CONCLUSIONS

During the months of August and September, 1963, a study was made of the Monongahela River System. The study included analyses and observations of chemical, biological, bacteriological and physical indicators of water quality.

Data collected during the 1963 study, along with other reports, information and data were used to prepare this report on the existing conditions of the Monongahela River and its tributaries to the Allegheny County, Pennsylvania, line.

The drainage area of the Monongahela Basin includes sections of three States: West Virginia, Maryland, and Pennsylvania. In addition to the Monongahela mainstem, seven interstate tributaries are considered in the report.

WATER USES

The mainstem of the Monongahela is canalized for navigation over its entire length of 129 miles.

All major public and industrial water supplies in the basin are drawn from surface sources, with the Monongahela serving as the major source. The main streams of the Monongahela serve as sources of water supply to a population of over 388,000 in the reaches considered. A total population of over 700,000 depends on the Monongahela and its tributaries as sources of domestic water supply. Industrial uses of the Monongahela surface waters exceed 6,000 million gallons per day (mgd) including 4,000 mgd for cooling water.

The Monongahela is presently used to a limited extent for recreation, including boating, bathing, and water skiing. Reservoirs on the tributary streams provide an inviting environment for water contact recreational activities. Fishing is limited to those reaches and tributaries not adversely affected by excessive acid mine drainage.

Four reservoirs are located on the tributaries to the Monongahela. Two of these, Lake Lynn on the Cheat River and Deep Creek Reservoir on Deep Creek, a tributary to the Youghiogheny, are used to produce peak load power. Two others, the Tygart Reservoir on the Tygart River and the Youghiogheny Reservoir on the Youghiogheny, are operated for low flow control.

POLLUTION

The Monongahela River and its tributaries have for a long time been abused by pollution resulting from large quantities of acid mine drainage, untreated sewage, and industrial waste.

Mine drainage, containing sulfuric acid and acid salts, is the most damaging waste in the streams of the Monongahela River Basin. Acid mine drainage changes the natural chemical character of the water in the receiving streams. These chemical changes cause immeasurable damages, which result from the acid conditions of the stream waters.

The water is expensive to treat for municipal and industrial uses. The acid waters are highly corrosive to steel and iron structures, such as boats, barges, bridge supports, culverts, pumps and concrete structures. The stream is made unfit for recreational uses, such as fishing and swimming. The biological processes are eliminated or altered to the point where the stream no longer sustains desirable aquatic life, including fish.

Calculations of estimated coliform bacteria densities were made on the Monongahela and West Fork Rivers to determine what levels might be expected to occur when acid wastes are reduced or acid concentrations lowered by increased stream flow. A population of 324,000 discharges raw and treated sewage to the Monongahela and Youghiogheny Rivers and their tributaries in the reaches considered to the Allegheny County, Pennsylvania, line.

Industries, other than mines, discharge organic wastes having a combined oxygen demand equivalent to that from a population of approximately 250,000. The 1959 ORSANCO Report lists a total organic load of 664,000 population equivalents being discharged to the Monongahela and West Fork Rivers. This includes both Sewage and industrial wastes discharging directly to the mainstem, and those discharging to the tributaries within 20 miles of confluence with the

Monongahela or West Fork.

EFFECTS OF POLLUTION

Conditions and Damages -- Monongahela River and Tributaries

Monongahela Mainstem (West Virginia-Pennsylvania)

Acid mine drainage, along with organic and bacterial pollution originating in the State of West Virginia, damaged the water quality both in West Virginia and at the State line. The river carried an acid load of 126 tons per day just below the State line. The residuals of these pollutants along with the added wastes in Pennsylvania, contributed to the degraded quality of the Monongahela in Pennsylvania.

The effects of the organic and bacterial pollution in the Monongahela are masked by the acid conditions of the streams. The masking effect reduces, but does not eliminate, the hazards associated with organic and bacterial pollution.

The calculated estimates of coliform bacteria densities in the Monongahela and West Fork Rivers ranged up to 350 times the level of 5,000 coliforms per 100 ml, recommended by the Ohio River Valley Water

Sanitation Commission for use as a source of water supply or for general recreation. The estimates ranged up to 1,650 times ORSANCO's recommended level of 1,000 coliforms per 100 ml for water contact sports. Calculated estimates of the coliform densities, under reduced acid conditions, show a potential of 70,000 per 100 ml at the State line. Severe biological degradation existed in the West Fork River from Gypsy, West Virginia, to its confluence with the Tygart to form the Monongahela, and in the Monongahela River across the State line at least to Charleroi, Pennsylvania. The calculated coliform densities indicate a health hazard in the use of the Monongahela as a source of domestic water supply and for recreation.

The acid conditions of the stream increased the cost of treating municipal and industrial water supplies taken from the Monongahela. The river, in general, was unfit for recreational uses, such as fishing, boating and swimming. The biological processes were altered so that the river no longer sustained desirable aquatic life, including fish.

Youghiogheny River (West Virginia-Maryland)

No known sources of pollution exist above the State line along the upper reaches of the Youghiogheny.

Interstate pollution was not found to occur in this reach of the river.

Snowy Creek (Tributary to the upper Youghiogheny and interstate between West Virginia and Maryland)

Acid mine drainage and bacterial pollution occurring in West Virginia damaged the Snowy Creek water quality in Maryland. The residual effects of these wastes, along with those contributed by Laurel Run, damaged the quality of the Youghiogheny downstream to Oakland, Maryland. Oakland uses the Youghiogheny as a source of water supply. Snowy Creek caused biological degradation of the Youghiogheny River in Maryland.

Laurel Run (Tributary to Snowy Creek and interstate between West Virginia and Maryland)

Acid mine drainage originating in West Virginia contributed to the severely degraded condition of Laurel Run at the Maryland State line. The residuals of these wastes contributed to the degraded quality of Snowy Creek and the Youghiogheny River in Maryland.

Casselman River (Tributary to the Youghiogheny and interstate between Maryland and Pennsylvania)

Bacterial pollution of the Casselman River, originating in Maryland, contributed to the bacteriologically degraded condition of the river at the State line. Acid mine drainage in Pennsylvania contributed to the additional degradation of the river prior to its confluence with the Youghiogheny. Flow from the Casselman River contributed to the degraded quality of the Youghiogheny River below Confluence, Pennsylvania.

Youghiogheny River (Maryland-Pennsylvania)

The State line crosses the Youghiogheny River in the Youghiogheny Reservoir pool. Just below the State line coliform bacteria densities of over 4,000 per 100 ml were present. These values are in excess of the 1,000 coliforms per 100 ml, recommended limit for water contact sports. The entire length of the Youghiogheny River Reservoir is used for water contact sports. Untreated sewage discharges from Friendsville, Maryland, contributed to these high coliform densities. Additional studies are needed to determine other possible sources contributing to the bacterial pollution.

Cheat River (Tributary to the Monongahela and interstate between West Virginia and Pennsylvania)

Acid mine drainage originating in West Virginia caused severe biological degradation of the Cheat River at the State line. The acid pollution originating in West Virginia, along with that contributed in Pennsylvania, added significant acid loads to the Monongahela River just downstream of the State line.

Dunkard Creek (Tributary to the Monongahela and interstate between West Virginia and Pennsylvania)

Acid mine drainage in Dunkard Creek caused severe biological degradation of the stream in its lower reaches. Additional studies are needed to determine the sources of acid drainage to Dunkard Creek. The stream is interstate at several points. The acid load discharged to the Monongahela by Dunkard Creek contributed to the degraded quality of the Monongahela in Pennsylvania.

Monetary Damages

Tangible Damages

Costs which can be expressed in dollars were estimated for damages that occur in the Monongahela to its confluence with the Allegheny at Pittsburgh.

The following table lists the damages for those items that can readily be estimated.

Annual Damages Due to Acid Conditions of the Monongahela River

	Annual Damages
Industrial Water Supplies	$1,220,000
Domestic Supplies	154,000
Boats	354,000
Barges	483,000
Lock and Dam Structures	40,000
Total	$2,251,000

Intangible Damages

No effort has been made to place a value on the damages to recreation, nuisance conditions, and public health hazards that are real, and are of equal or greater significance than those listed, but are intangible.

Physical damages to real property on which data were not available include damages to water intake structures and conveyance facilities, pumps, highway structures, the added expense of providing acid resistant facilities, and the damages to mining operations.

The damages considered as intangible in all probability equal or exceed those listed in the above $2,251,000 annual damages .

CONCLUSIONS

Pollution of the Monongahela River and its tributaries in several interstate reaches is evident. Pollution originating in West Virginia damaged the water quality at the Pennsylvania State line in the Monongahela and Cheat Rivers, and contributed to the degraded quality of the Monongahela downstream to Charleroi, Pennsylvania. Pollution also originating in West Virginia, in Snowy Creek and Laurel Run, damaged the water quality of the upper Youghiogheny in Maryland. Pollution originating in Maryland contributed to the high bacteria densities at and below the Maryland-Pennsylvania State line on the Casselman and Youghiogheny Rivers.

Acid mine drainage, untreated sewage, and industrial wastes discharged to the Monongahela River, Cheat River, Laurel Run, and Snowy Creek, in the State of West Virginia, constitute interstate pollution subject to abatement under the Federal Water Pollution Control Act, since the health and welfare of persons in States other than that in which the pollution originates are endangered.

ACKNOWLEDGMENTS

The preparation of this report depended largely on the cooperation of numerous agencies and individuals

The Ohio River Basin Project Office provided assistance in performing the study. The United States Geological Survey provided flow information during the period of the study.

The Pittsburgh Regional Office of the Pennsylvania Health Department provided available reports on the Monongahela and other information concerning the uses of the Monongahela and its tributaries in Pennsylvania.

The West Virginia Division of Water Resources provided information on uses and sources of water pollution in the West Virginia section of the basin.

The State of Maryland provided field reports,

along with other information and data relating to the condition of Monongahela tributaries in Maryland.

The Ohio River Valley Sanitation Commission Office provided reports, and other information from which valuable information was obtained for preparing the report.

Personnel of the Pollution Evaluation Unit, Technical Advisory and Investigations Section, providing assistance in preparing the report, included A. W. West, R. K. Ballentine, C. Runas, F. W. Kittrell, Dwight Ballinger, and several others.

Preparation of the biological section of the report was possible because of the excellent field work of Jack Geckler and Kenneth Mackenthun, biologists, also of Technical Advisory and Investigations Section.

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APPENDIX A

INDIVIDUAL RESULTS

APPENDIX A

DATE 1963								As mg/l of $CaCO_3$					
					pH			ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/l	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	To M.O.	EDTA	micro-mhos
M-1 MONONGAHELA RIVER NEAR CHARLEROI, PA. AT LOCK 4 & RM 41.4													
Aug.	19	1:30 P	1600	24	-	3.5	8.8	39	57	13	-	284	740
	20	2:30 P	1700	23	-	3.7	8.8	36	25	5	-	261	680
	21	2:50 P	3000	24	-	4.0	9.1	25	20	3	-	196	530
	22	1:45 P	3640	24	-	4.0	8.5	23	19	8	-	208	550
	23	10:00 A	3320	24	-	4.1	9.8	22	17	3	-	200	540
	26	12:30 P	1650	24	-	4.3	8.9	18	11	1	-	112	350
	27	11:15 A	1820	23	4.5	4.1	8.8	14	14	1	-	108	355
	28	10:25 A	1850	24	3.8	4.3	9.0	16	13	1	-	119	370
	29	11:10 A	2000	24	3.8	4.1	8.8	23	19	1	-	118	365
	30	11:20 A	3000	24	3.9	4.1	8.7	19	17	4	-	128	390
Maximum				24	4.5	4.3	9.8	39	57	13	-	284	740
Minimum				23	3.8	3.5	8.5	14	11	1	-	108	350
Average			2402	24	4.0	4.0	8.9	24	21	4	-	173	487
M-2A MONONGAHELA RIVER AT MILLSBORO, PA. WATER PLANT RM 65.3													
Aug.	19	2:45 P		25	-	3.7	8.3	15	15	5	-	140	400
	20	1:30 P		24	-	4.2	8.2	18	15	2	-	123	375
	21	1:15 P		25	-	4.0	8.5	14	12	2	-	104	350
Maximum				25	-	4.2	8.5	18	15	5	-	140	400
Minimum				24	-	3.7	8.2	14	12	2	-	104	350
Average			2400(est.)	25	-	4.0	8.3	16	14	3	-	122	375

APPENDIX A

DATE 1963								As mg/1 of $CaCO_3$					
								ACIDITY			ALK.	HARDNESS	CONDUCT.
No.	Day	Sampling Time	Flow cfs	Temp °C	pH Field	pH Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
							M-3 MONONGAHELA RIVER NEAR GREENSBORO, PA. AT LOCK 7 & RM 85.0						
Aug.	19	4:00 P	1720	24	-	3.5	8.2	18	16	8	-	104	325
	20	4:25 P	1810	24	-	3.9	8.5	18	16	3	-	103	320
	21	12:10 P	4220	23	-	3.6	7.5	22	23	5	-	82	292
	22	10:35 A	3300	24	-	3.7	7.2	20	18	8	-	76	265
	23	7:50 A	3190	22	-	4.0	6.7	18	18	3	-	76	255
	26	5:30 P	1870	24	-	3.9	7.5	22	19	5	-	112	335
	27	8:50 A	1750	22	4.3	3.9	8.0	29	22	6	-	174	490
	28	1:20 P	1870	24	3.6	3.9	7.3	24	20	5	-	126	380
	29	8:50 A	2770	23	3.7	3.9	7.6	28	22	5	-	123	380
	30	9:25 A	2960	23	4.1	3.8	7.7	23	21	7	-	82	275
Maximum				24	4.3	4.0	8.5	29	23	8	-	174	490
Minimum				22	3.6	3.5	6.7	18	16	3	-	76	255
Average			2441	23	3.9	3.8	7.6	22	20	6	-	106	367

APPENDIX A

DATE								As mg/l of $CaCO_3$					
1963					pH			ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/l	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
M-4 MONONGAHELA RIVER NEAR PT. MARION, PA. AT LOCK 8 & RM 90.7													
Aug.	19	5:00 P	-	24	-	3.3	8.7	25	13	9.0	-	107	305
	20	9:50 A	-	24	-	3.9	8.0	26	23	6.0	-	104	345
	21	10:15 A	-	22	-	3.7	8.3	23	19	4.0	-	98	335
	22	10:20 A	-	24	-	3.7	7.6	24	20	8.0	-	158	455
	23	3:20 P	-	24	-	4.0	8.5	35	29	3.0	-	204	560
	26	11:00 A	-	23	4.2	4.2	8.5	20	16	4.0	-	145	400
	27	4:30 P	-	26	-	3.8	7.8	22	20	5.0	-	137	400
	28	7:00 A	-	21	4.6	4.1	8.2	19	24	7.0	-	127	365
	29	3:50 P	-	25	4.6	4.0	8.29	20	17	4.0	-	122	365
	30	8:20 A	-	22	4.4	3.8	7.8	22	19	7.0	-	124	380
Maximum				26	4.6	4.2	8.7	35	29	9.0	-	204	455
Minimum				21	4.2	3.3	7.6	19	13	3.0	-	98	305
Average			1940 (est.)	24	4.5	3.9	8.2	24	20	6.0	-	133	391

APPENDIX A

DATE								As mg/1 of $CaCO_3$					
1963								ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
							M-5 MONONGAHELA RIVER NEAR MORGANTOWN, W.VA. AT HWY. 7 BRIDGE (RM 98.0)						
Aug.	14	10:45 A	-	26	-		7.8	-	-	-	-	104	300
	15	10:55 A	-	22	-	-	8.0	-	-	-	-	102	285
	16	10:05 A	-	22	-	4.3	8.5	18	12	2	-	95	285
	19	6:00 P	-	24	-	4.0	9.0	10	8	2	-	102	285
	20	5:40 P	-	24	-	4.4	9.0	22	15	-	1	154	425
	21	10:00 A	-	22	-	3.8	8.1	31	23	7	-	199	540
	22	8:50 A	-	22	-	3.8	7.9	39	17	8	-	182	480
	23	5:50 A	-	22	-	4.4	8.5	16	14	-	2	138	370
	26	6:45 P	-	25	-	4.1	9.0	20	14	5	-	120	360
	27	6:50 A	-	22	4.8	4.1	7.9	15	12	1	-	115	340
	28	4:05 P	-	24	4.1	4.2	8.2	22	15	5	-	137	395
	29	6:40 A	-	22	4.2	4.2	7.7	28	17	2	-	171	465
	30	7:40 A	-	22	3.8	4.1	6.8	35	25	2	-	233	600
Maximum				26	4.8	4.4	9.0	39	25	8	2	233	600
Minimum				22	3.8	3.8	6.8	10	8	0	0	95	285
Average			1710(est.)	23	4.2	4.1	8.2	23	16	4	0	143	395

APPENDIX A

M-6
MONONGAHELA RIVER NEAR FAIRMONT, W.VA. AT LOCK 15 (RM 124.6)

DATE 1963								As mg/1 of $CaCO_3$					
					pH			ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
Aug.	14	7:30 P	2620	22	-	-	6.3	-	-	-	-	185	510
	15	9:45 A	2480	20	-	-	7.1	-	-	-	-	235	610
	16	9:50 P	1880	20	-	5.5	7.8	4	8	-	5	119	300
	19	3:50 P	939	24	-	6.2	7.1	4	6	-	3	109	280
	20	9:00 A	1190	22	-	6.2	6.9	7	5	6	6	87	238
	21	5:20 P	2560	23	-	3.9	6.7	61	49	-	-	316	800
	22	9:10 A	1530	22	-	4.9	7.1	18	16	-	2	184	445
	23	3:10 P	1170	24	-	5.1	7.0	7	11	-	5	157	380
	26	7:20 P	920	24	6.3	6.0	7.1	11	3	-	3	105	285
	27	9:40 A	869	23	-	5.9	7.2	8	5	-	5	88	240
	28	4:40 P	835	24	6.4	5.5	7.6	10	6	-	4	105	280
	29	5:10 P	-	24	5.9	6.2	6.8	10	6	-	8	102	300
	30	6:55 A	-	22	6.0	5.6	7.1	6	4	-	3	95	263
Maximum				24	6.4	6.2	7.8	61	49	6	8	316	610
Minimum				20	5.9	3.9	6.3	4	3	-	2	88	238
Average			1544	23	6.2	5.5	7.0	16	11	-	4	145	379

APPENDIX A

DATE 1963		Sampling	Flow	Temp.	pH		D.O.	As mg/l of $CaCO_3$ ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Time	cfs	°C	Field	Lab.	mg/l	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
								MD-7 DUNKARD CREEK NEAR SHANNOPIN, PA. AT U.S.G.S. STA. 720 (RM 87.1-3.5)					
Aug.	19	4:30 P	5.1	22	-	2.8	10.2	700	660	500	-	922	3150
	20	4:45 P	4.8	23	-	2.8	9.9	710	660	365	-	912	3100
	21	11:40 A	4.8	21	-	2.8	7.7	720	660	405	-	954	3200
	22	10:00 A	4.8	21	-	2.8	8.4	730	680	385	-	1000	3250
	23	7:05 A	6.1	20	-	2.8	7.8	770	820	440	-	1028	3400
	26	5:50 P	4.4	24	-	2.7	10.5	970	820	430	-	1066	3600
	27	8:00 A	4.4	16	3.5	2.7	7.9	970	830	410	-	1058	3600
	28	3:00 P	4.1	22	3.2	2.8	10.2	1060	610	520	-	1100	3600
	29	7:55 A	5.1	21	3.0	2.7	8.2	1010	830	480	-	1104	3670
	30	8:30 A	4.4	20	3.0	2.7	8.5	940	850	470	-	1118	3630
Maximum				24	3.5	2.8	10.5	1060	850	520	-	1118	3670
Minimum				16	3.0	2.7	7.7	700	610	365	-	912	3100
Average			4.8	21	3.2	2.8	8.9	858	742	440	-	1026	3420

APPENDIX A

MB-8

BUFFALO CREEK NEAR BARRICKVILLE, W.VA. AT U.S.G.S. STA. 615 (RM 125.4-3.0)

DATE 1963		Sampling	Flow	Temp.	pH		D.O.	As mg/l of $CaCO_3$					CONDUCT.
								ACIDITY			ALK.	HARDNESS	
No.	Day	Time	cfs	°C	Field	Lab.	mg/l	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
Aug.	14	8:45 P	39	20	-	-	-	-	-	-	-	254	870
	15	5:30 P	33	22	-	-	10.0	-	-	-	-	285	820
	16	5:30 P	19	22	-	7.3	11.9	0	3	-	57	205	690
	19	8:15 A	9	18	-	7.2	7.8	0	2	-	78	316	1400
	20	4:05 P	8.3	22	-	6.5	10.5	0	1	-	60	288	980
	21	5:45 P	10	24	-	6.9	11.6	0	1	-	160	296	1000
	22	8:40 A	7.8	21	-	6.9	7.3	0	8	-	162	481	2580
	23	3:45 P	7.5	24	-	7.4	12.2	0	5	-	61	330	1040
	26	9:10 A	6.0	18	7.3	7.3	7.7	0	8	-	144	468	2150
	27	9:00 A	4.0	18	-	7.4	7.8	0	5	-	82	404	1270
	28	4:15 P	3.2	23	6.6	7.5	11.7	0	3	-	75	536	1480
	29	6:00 P	-	23	6.6	7.6	9.3	0	5	-	72	400	1380
	30	6:00 A	-	20	6.6	7.4	7.1	0	4	-	75	408	1360
Maximum				24	7.3	7.6	12.2	0	8	-	162	536	2580
Minimum				18	6.6	6.5	7.3	0	1	-	57	205	690
Average			13.3	21	6.8	7.2	9.6	0	4	-	93	359	1310

APPENDIX A

MW-9

WEST FORK RIVER SOUTH OF MONONGAH, W. VA. AT RT. 250 BRIDGE (RM 128.7-4.4)

DATE 1963								As mg/1 of $CaCo_3$					
								ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micromhos
Aug.	19	9:10 A	156	20	-	3.6	7.7	72	55	15	-	446	1060
	20	3:10 P	528	23	-	3.9	6.8	50	37	8	-	384	920
	21	9:10 A	1340	21	-	3.9	6.7	42	27	5	-	406	900
	22	8:45 A	464	22	-	4.0	7.3	24	24	5	-	281	645
	23	4:10 P	336	24	-	4.1	7.1	21	13	2	-	274	630
	26	9:45 A	168	22	4.4	4.0	6.9	23	24	6	-	349	810
	27	8:20 P	144	24	5.0	4.9	8.2	3	0	0	1	78	205
	28	8:30 A	120	22	5.5	4.2	7.7	14	14	1	-	142	375
	29	8:30 A	-	23	4.7	4.6	7.9	10	7	0	1	92	255
	30	5:50 P	-	25	4.3	4.1	10.3	21	16	2	-	198	525
Maximum				25	5.5	4.9	10.3	72	55	15	1	446	1060
Minimum				20	4.3	3.6	6.7	3	0	0	0	78	205
Average			501*	23	4.8	4.1	7.7	28	22	4	0	265	633

* **Data For 8/14 - 8/30**

APPENDIX A

DATE 1963		Sampling	Flow	Temp.	pH		D.O.	As mg/1 of $CaCO_3$					
								ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Time	cfs	°C	Field	Lab.	mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
								MW-10 WEST FORK RIVER NEAR GYPSY, W. VA. AT HWY. 19 BRIDGE (RM 128.7-20.0)					
Aug.	14	7:10 P	-	22	-	-	7.0	-	-	-	-	283	575
	15	4:10 P	-	22	-	-	8.0	-	-	-	-	324	675
	16	4:20 P	-	23	-	4.0	7.8	40	27	5	-	328	730
	19	9:45 A	-	20	-	3.0	7.0	112	190	42	-	485	1180
	20	2:45 P	-	22	-	4.6	5.6	22	20	0	3	384	800
	21	9:50 A	-	20	-	4.4	8.0	20	20	0	1	289	620
	22	9:30 A	-	21	-	4.2	7.0	11	15	0	1	277	590
	23	3:25 P	-	24	-	3.8	7.3	36	24	5	-	302	685
	26	10:00 A	-	20	4.3	3.5	7.0	60	52	17	-	432	1000
	27	7:30 P	-	24	3.3	3.4	7.9	126	61	1	-	480	1120
	28	9:45 A	-	20	3.4	3.4	6.8	117	71	29	-	502	1210
	29	8:45 A	-	22	3.1	3.2	7.2	133	89	40	-	532	1280
	30	5:00 P	-	24	3.6	3.2	7.4	98	85	40	-	608	1370
Maximum				24	4.3	4.6	8.0	133	190	42	3	608	1370
Minimum				20	3.1	3.0	5.6	11	15	0	0	277	575
Average			315(est.)	22	3.5	4.1	7.3	70	60	16	0	402	910

APPENDIX A

DATE 1963 Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/1	As mg/l of CaCO$_3$ ACIDITY Hot to Phenoth.	ACIDITY Cold to Phenoth.	ACIDITY Cold to M.C.	ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos
							MW-11 WEST FORK RIVER NEAR CLARKSBURG, W.VA. AT U.S.G.S. GAGE 590 (RM 128.7-31.9)						
Aug.	14	6:00 P	694	22	-	-	8.0	-	-	-	-	196	385
	15	3:20 P	305	23	-	-	8.1	-	-	-	-	171	350
	16	3:30 P	162	22	-	7.5	8.7	3	2	-	30	209	410
	19	10:25 A	60	21	-	5.8	8.0	10	0	-	28	212	420
	20	2:15 P	380	22	-	6.1	8.4	4	2	-	27	220	445
	21	10:20 A	410	21	-	6.1	8.3	0	3	-	21	172	370
	22	9:55 A	230	21	-	7.0	8.4	4	2	-	17	192	395
	23	2:45 P	145	24	-	6.8	8.7	6	1	-	24	211	430
	26	11:00 A	57	22	6.4	7.0	8.4	3	3	-	16	224	440
	27	6:45 P	44	24	7.5	6.7	3.7	2	4	-	31	230	450
	28	10:20 A	35	23	7.2	7.1	8.9	1	3	-	31	229	460
	29	10:30 A	39	23	6.6	7.2	8.7	4	3	-	35	228	450
	30	4:00 P	34	25	7.1	7.1	9.2	0	1	-	33	225	440
Maximum				25	7.5	7.5	9.2	10	4	-	35	230	460
Minimum				21	6.4	5.8	3.7	0	0	-	16	171	350
Average			199.6	22	7.0	6.8	8.1	3	2	-	27	209	420

APPENDIX A

DATE								As mg/1 of $CaCO_3$					
1963		Sampling Time	Flow cfs	Temp. °C	pH		D.O. mg/1	ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day				Field	Lab.		Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
MT-12 TYGART RIVER NEAR COLFAX, W.VA. AT U.S.G.S. GAGE 570 (RM 128.7-4.9)													
Aug.	14	9:45 A	1690	20	-	-	8.2	-	-	-	-	42	103
	15	9:30 A	1540	20	-	-	9.0	-	-	-	-	42	108
	16	9:25 A	1490	20	-	7.5	8.5	0	0	-	-	39	102
	19	3:20 A	886	24	-	4.8	8.5	2	4	-	4	38	98
	20	9:20 A	970	21	-	5.2	8.6	4	1	-	5	39	102
	21	4:40 P	1130	24	-	5.5	8.4	4	1	-	4	54	136
	22	4:20 P	935	25	-	6.4	8.3	2	2	-	4	45	114
	23	8:45 A	830	22	-	6.6	8.4	3	1	-	3	42	110
	26	8:00 P	865	24	6.0	6.6	8.2	3	1	-	3	39	102
	27	6:55 A	851	20	6.8	6.3	8.5	3	1	-	4	41	106
	28	5:30 P	844	24	7.4	6.2	8.4	3	1	-	4	41	104
	29	8:00 A	-	22	5.9	5.6	8.0	2	3	-	4	40	102
	30	8:00 A	-	22	5.9	5.4	8.6	3	2	-	3	40	104
Maximum				25	7.4	7.5	9.0	4	4	-	5	54	136
Minimum				20	5.9	5.2	8.0	0	0	-	3	38	98
Average			1094	22	6.4	6.0	8.4	2	2	-	4	42	107

APPENDIX A

DATE 1963 Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/1	As mg/1 of $CaCO_3$ ACIDITY Hot to Phenoth.	ACIDITY Cold to Phenoth.	ACIDITY Cold to M. O.	ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos

MT-13
TYGART RIVER NEAR GRAFTON, W.VA. AT HWY. 50 BRIDGE (RM 128.7-18.6)

DATE 1963 Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M. O.	ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos
Aug.	14	11:35 A	-	20	-	-	9.0	-	-	-	-	46	118
	15	10:30 A	-	21	-	-	9.2	-	-	-	-	38	96
	16	10:10 A	-	20	-	5.6	9.0	4	3	-	2	37	96
	19	11:30 A	-	22	-	4.8	-	2	5	-	2	40	102
	20	1:10 P	-	22	-	5.2	8.8	4	3	-	4	45	116
	21	11:05 A	-	22	-	5.8	8.6	2	2	-	4	46	117
	22	10:45 A	-	22	-	5.7	8.6	2	3	-	3	42	106
	23	1:55 P	-	22	-	7.6	9.0	3	1	-	2	40	104
	26	12:00 N	-	22	5.9	5.9	8.8	3	1	-	3	41	105
	27	5:55 P	-	24	7.0	6.0	9.2	3	3	-	3	40	102
	28	11:20 A	-	23	7.5	6.0	8.6	6	1	-	4	41	104
	29	11:15 A	-	22	5.7	5.6	8.3	5	3	-	4	44	116
	30	3:00 P	-	25	5.3	4.9	8.9	8	7	-	3	50	133
Maximum				24	7.5	7.6	9.2	8	7	-	4	50	133
Minimum				20	5.3	4.9	8.2	2	1	-	2	37	96
Average			1040(est)	22	6.3	5.7	8.8	4	3	-	3	42	109

APPENDIX A

DATE 1963								As mg/1 of $CaCO_3$					
					pH			ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth	Cold to M.O.	to M.O.	EDTA	micro-mhos
MC-14 CHEAT RIVER AT CHEAT DAM (RM 89.4-3.5)													
Aug.	19	10:00 A	-	22	-	4.0	7.3	10	10	2	0	42	131
	20	10:15 A	-	23	-	4.0	6.2	20	19	3	0	52	182
	21	10:45 A	-	23	-	5.1	8.2	9	8	0	5	45	135
	22	11:10 A	-	24	-	4.3	9.9	10	9	0	1	46	134
	23	2:55 P	-	25	-	4.9	8.8	9	7	0	1	44	130
	26	11:30 A	-	23	4.8	4.4	7.0	8	7	0	1	44	128
	27	4:00 P	-	25	-	4.6	7.1	8	7	0	2	44	121
	28	7:40 A	-	23	4.6	4.4	7.2	8	8	0	1	44	124
	29	3:20 P	-	25	5.1	4.5	8.4	9	6	0	1	44	125
	30	9:10 A	-	24	4.5	4.4	8.4	8	7	0	1	44	126
Maximum				25	5.1	5.1	9.9	20	19	3	5	52	182
Minimum				22	4.5	4.0	6.2	8	6	0	0	42	121
Average			1330(est)	24	4.8	4.5	7.9	10	9	0	1	45	134

APPENDIX A

DATE 1963		Sampling	Flow	Temp.	pH		D.O.	As mg/1 of $CaCO_3$					
								ACIDITY			ALK.	HARDNESS	CONDUCT.
No.	Day	Time	cfs	°C	Field	Lab.	mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
							MC-15 CHEAT RIVER AT HWY. 73 BRIDGE (CHEAT LAKE) RM 89.4-9.3						
Aug.	14	12:00 N	-	24	-	-	6.8	-	-	-	-	39	98
	15	11:30 A	-	23	-	-	7.2	-	-	-	-	38	92
	16	10:55 A	-	24	-	5.0	6.6	4	7	-	5	39	100
	19	9:25 A	-	22	-	4.4	7.2	4	3	-	1	42	109
	20	3:25 P	-	24	-	4.6	7.4	6	6	-	2	42	118
	21	4:20 P	-	26	-	4.9	7.8	6	5	-	5	42	120
	22	4:30 P	-	26	-	4.3	7.3	10	8	-	1	47	133
	23	9:15 A	-	24	-	5.1	7.5	7	6	-	2	43	119
	26	6:00 P	-	24	6.6	6.1	7.0	2	3	-	3	36	90
	27	10:45 A	-	24	-	4.8	6.9	7	5	-	2	41	114
	28	2:45 P	-	24	5.7	5.6	6.8	3	4	-	3	37	93
	29	7:10 A	-	22	6.2	5.3	6.7	6	3	-	2	39	102
	30	3:50 P	-	25	6.0	5.6	7.3	4	2	-	2	40	98
Maximum				26	6.6	6.1	7.8	10	8	0	5	47	133
Minimum				22	5.7	4.3	6.6	2	2	0	1	36	92
Average			1300(est)	24	6.1	5.1	7.1	5	5	0	3	40	106

APPENDIX A

								As mg/1 of $CaCO_3$					
DATE 1963					pH			ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
MC-16 CHEAT RIVER NEAR ALBRIGHT AT HWY. 26 BRIDGE (RM 89.4-27.7)													
Aug.	14	5:20 P	-	21	-	-	8.5	-	-	-	-	34	85
	15	5:40 P	-	22	-	-	8.7	-	-	-	-	34	83
	16	3:00 P	-	26	-	6.5	8.2	0	5	-	2	32	81
	19	6:00 P	-	32	-	4.2	7.4	8	5	2	0	40	110
	20	10:40 A	-	26	-	4.4	7.9	9	10	-	1	48	143
	21	3:20 P	-	26	-	5.9	8.3	1	3	-	10	33	85
	22	3:00 P	-	30	-	6.2	8.0	2	2	-	4	34	86
	23	10:05 A	-	23	-	6.4	8.2	2	1	-	8	30	74
	26	5:35 P	-	28	6.8	7.1	8.2	2	1	-	10	31	75
	27	3:40 P	-	30	7.3	6.6	8.1	3	1	-	5	34	85
	28	1:30 P	-	29	7.2	6.5	7.8	3	1	-	5	33	80
	29	1:30 P	-	24	6.4	6.1	7.8	7	3	-	5	43	101
	30	10:00 A	-	24	6.1	5.9	8.3	5	4	-	5	37	94
Maximum				30	7.3	7.1	8.7	9	10	2	10	48	143
Minimum				21	6.1	4.2	7.4	0	1	0	0	30	74
Average			960 (est)	26	6.8	6.1	8.1	4	3	0	5	36	92

APPENDIX A

MC-17

CHEAT RIVER NEAR ROWLESBURG, W.VA. AT U.S.G.S. GAGE 700 (R.R.BRIDGE) RM 89.4-45.0

DATE 1963 Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/l	As mg/l of $CaCO_3$ ACIDITY Hot to Phenoth.	ACIDITY Cold to Phenoth.	ACIDITY Cold to M.O.	ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos
Aug.	14	1:15 P	1320	20	-	-	8.0	-	-	-	-	28	64
	15	12:30 P	930	19	-	-	9.0	-	-	-	-	28	66
	16	11:20 A	620	18	-	7.0	8.6	0	4	-	8	24	59
	19	1:25 P	340	23	-	6.9	8.5	1	2	-	6	32	82
	20	11:30 A	820	20	-	6.5	8.6	1	1	-	9	27	66
	21	12:10 P	1070	21	-	6.3	8.5	2	1	-	12	29	72
	22	11:55 A	1280	22	-	6.2	8.5	1	2	-	10	24	60
	23	12:55 P	1460	22	-	6.8	8.2	2	1	-	10	24	55
	26	1:55 P	740	22	6.4	7.2	8.7	3	1	-	8	0	69
	27	4:45 P	500	24	7.7	7.3	8.4	3	1	-	9	28	66
	28	12:30 P	410	23	7.5	6.8	8.4	2	1	-	14	30	68
	29	12:45 P	685	22	6.5	6.6	7.5	5	2	-	13	32	76
	30	2:00 P	1700	21	6.8	6.6	8.8	3	1	-	10	26	66
Maximum				24	7.7	7.3	9.0	5	4	-	14	32	88
Minimum				18	6.4	6.2	7.5	0	1	-	6	24	60
Average			913	21	7.0	6.7	8.4	2	2	-	10	28	67

APPENDIX A

DATE 1963					pH			As mg/l of $CaCO_3$ ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/l	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
							MY-18 YOUGHIOGHENY RIVER NEAR SUTERSVILLE, PA. AT U.S.G.S. GAGE 835 (RM 15.6-12.4)						
Aug.	19	11:00 A	870	20	-	4.3	8.5	12	15	-	0	86	275
	20	1:15 P	880	21	-	5.3	8.6	9	11	-	3	85	267
	21	4:00 P	880	24	-	5.6	8.9	12	11	-	7	76	240
	22	2:45 P	850	24	-	5.5	8.6	12	11	-	5	78	250
	23	11:15 A	885	22	-	6.5	8.2	10	12	-	3	83	270
	26	3:15 P	796	22	-	5.1	9.1	12	11	-	3	95	290
	27	12:40 P	805	22	5.7	5.6	8.8	12	12	-	3	91	290
	28	9:15 A	850	20	5.2	5.9	8.1	10	13	-	5	86	275
	29	2:20 P	890	24	5.2	5.6	8.6	10	4	-	3	72	220
	30	12:20 P	900	22	5.4	5.6	8.4	10	11	-	3	76	237
Maximum				24	5.7	6.5	9.1	12	15	-	7	95	290
Minimum				20	5.2	4.3	8.1	9	4	-	0	72	220
Average			859	22	5.4	5.5	8.6	11	11	-	4	84	261

APPENDIX A

DATE								As mg/1 of $CaCO_3$					
1963		Sampling Time	Flow cfs	Temp. °C	pH		D.O. mg/1	ACIDITY			ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos
No.	Day				Field	Lab.		Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.			
MY-19 YOUGHIOGHENY RIVER IN CONNELLSVILLE, PA. AT CRAWFORD AVE. BRIDGE (RM 15.6-44.4)													
Aug.	19	11:15 A	807	17	-	5.0	-	2	2	-	9	33	95
	20	11:10 A	851	18	-	5.8	9.2	2	2	-	5	35	88
	21	12:00 N	785	20	-	8.0	9.3	1	2	-	7	38	94
	22	12:15 P	829	21	-	6.8	8.8	2	1	-	5	40	100
	23	1:50 P	818	22	-	7.9	9.3	2	1	-	2	49	120
	26	1:10 P	720	18	7.6	6.6	9.5	3	2	-	4	38	97
	27	2:45 P	796	20	-	6.7	9.4	2	1	-	7	35	88
	28	9:10 A	785	18	5.6	6.3	9.0	4	1	-	6	31	79
	29	1:25 P	829	24	6.4	6.5	8.8	4	3	-	7	30	77
	30	10:25 A	851	20	6.1	6.2	9.0	1	1	-	5	32	81
Maximum				24	7.6	8.0	9.5	4	3	-	9	49	120
Minimum				17	5.6	5.0	8.8	1	1	-	2	30	77
Average			802	20	6.4	6.6	9.1	2	2	-	5	37	92

DATE								As mg/1 of $CaCO_3$					
1963								ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
						MY-20 YOUGHIOGHENY RIVER AT HWY. 281 BRIDGE IN PA. (RM 15.6-68.9)							
Aug.	19	2:10 P	788	17	-	5.6	9.5	2	3	-	5	20	54
	20	12:45 P	764	16	-	5.8	9.4	1	4	-	6	21	55
	21	2:00 P	764	17	-	7.0	9.6	1	1	-	10	21	56
	22	1:40 P	796	17	-	5.9	9.3	3	1	-	7	22	55
	23	11:45 A	788	17	-	7.6	9.4	2	1	-	7	22	56
	26	2:40 P	740	18	7.2	6.7	9.1	2	2	-	6	22	55
	27	1:15 P	788	18	-	6.6	9.1	3	1	-	7	22	57
	28	11:10 A	780	18	5.8	6.4	9.1	3	3	-	9	22	56
	29	11:20 A	788	18	6.0	6.3	9.0	3	2	-	8	23	57
	30	12:25 P	804	18	6.5	6.3	9.2	3	2	-	8	22	56
Maximum				18	7.2	7.6	9.6	3	4	-	10	23	57
Minimum				16	5.8	5.6	9.0	1	1		5	20	54
Average			772	17	6.4	6.4	9.3	2	2	-	7	22	56

APPENDIX A

DATE 1963 Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/1	As mg/1 of $CaCO_3$ ACIDITY Hot to Phenoth.	ACIDITY Cold to Phenoth.	ACIDITY Cold to M. O.	ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos
MY-21 YOUGHIOGHENY RESERVOIR AT HWY. 40 BRIDGE IN PA. (RM 15.6-76.6)													
Aug.	19	4:00 P	-	24	-	5.3	8.1	1	2	-	8	22	57
	20	2:35 P	-	23	-	5.8	8.0	2	1	-	8	20	56
	21	3:30 P	-	24	-	5.8	8.4	3	1	-	8	21	56
	22	3:30 P	-	24	-	6.8	8.5	3	1	-	8	22	56
	23	10:10 A	-	23	-	7.3	8.3	2	1	-	7	21	55
	26	5:05 P	-	24	7.6	6.8	8.2	2	1	-	7	20	56
	27	11:30 A	-	23	-	6.8	8.4	3	1	-	6	21	56
	28	1:45 P	-	24	6.6	6.6	8.5	2	1	-	7	22	55
	29	8:35 A	-	22	6.8	6.3	8.4	4	2	-	12	21	56
	30	2:35 P	-	23	6.4	6.5	8.8	2	1	-	6	21	55
Maximum				24	7.6	7.3	8.8	4	2	-	12	22	57
Minimum				22	6.4	5.3	8.1	1	1	-	6	20	55
Average			121(est)	23	6.9	6.4	8.4	2	1	-	8	21	56

APPENDIX A

DATE 1963								As mg/1 of $CaCO_3$					
					pH			ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
MY-210 YOUGHIOGHENY RIVER NEAR OAKLAND, MD. (RM 15.6-111.9)													
Aug.	14	2:40 P	-	18	-	-	8.2	-	-	-	-	32	72
	15	3:40 P	-	18	-	-	8.0	-	-	-	-	32	85
	16	12:30 P	-	18	-	7.0	8.1	0	5	-	12	32	86
	21	1:05 P	-	19	-	6.0	7.7	1	3	-	5	30	81
	22	12:50 P	-	20	-	6.6	7.7	2	2	-	14	30	83
	23	11:45 A	-	19	-	6.7	7.8	1	2	-	10	31	80
	26	3:05 P	-	20	6.4	6.8	8.1	2	1	-	9	38	92
	27	1:15 P	-	20	7.2	6.8	7.8	4	1	-	11	39	108
	28	3:20 P	-	21	7.3	6.5	7.7	2	3	-	12	42	116
	29	2:50 P	-	18	6.5	6.9	6.2	12	8	-	18	47	227
	30	11:00 A	-	17	6.6	6.3	7.5	5	3	-	12	28	83
Maximum				21	7.3	7.0	8.2	12	8	-	18	47	227
Minimum				17	6.4	6.0	6.2	0	1	-	5	30	72
Average			83 (est)	19	6.8	6.6	7.7	3	3	-	11	34	106

APPENDIX A

DATE 1963 Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/l	As mg/l of $CaCO_3$ ACIDITY Hot to Phenoth.	ACIDITY Cold to Phenoth.	ACIDITY Cold to M.O.	ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos
MY-22 YOUGHIOGHENY RIVER NEAR OAKLAND, MD. AT SILVER KNOB RD. (RM 15.6-119.5)*													
Aug.	13	-	-	18	-	-	7.3	-	-	-	-	33	58
	14	4:05 P	-	16	-	-	7.8	-	-	-	-	24	55
	15	4:10 P	-	16	-	-	9.4	-	-	-	-	24	53
	16	1:55 P	-	20	-	6.8	9.2	0	3	-	16	22	56
	20	3:20 P	-	16	-	6.8	-	3	3	-	13	24	59
	21	2:10 P	-	18	-	5.8	8.0	2	2	-	16	22	51
	22	1:45 P	-	18	-	6.0	8.6	0	1	-	15	22	48
	23	11:00 A	-	16	-	7.3	8.6	2	2	-	9	20	49
	26	4:30 P	-	18	6.5	7.3	9.9	1	1	-	7	22	52
	27	2:35 P	-	18	7.7	7.3	10.0	3	1	-	19	23	54
	28	2:50 P	-	18	7.5	6.9	9.9	3	2	-	17	25	56
	29	3:30 P	-	17	6.3	6.7	7.5	7	5	-	17	25	49
	30	11:45 A	-	16	6.6	6.5	8.2	2	3	-	-	21	52
Maximum				20	7.7	7.3	10.0	7	5	-	19	33	99
Minimum				16	6.3	5.8	7.3	0	1	-	7	20	48
Average			78 (est)	18	6.9	6.7	8.7	2	2	-	14	24	53

* Sample taken on Mansfield Rd. August 26th through August 30th.

APPENDIX A

DATE 1963 Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/l	As mg/l of $CaCO_3$ ACIDITY Hot to Phenoth.	ACIDITY Cold to Phenoth.	ACIDITY Cold to M.O.	ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos
MYC-23 CASSELMAN RIVER NEAR CONFLUENCE, PA. AT HWY. 53 BRIDGE (RM 15.6-63.6-1.0)													
ug.	19	2:35 P	22	23	-	3.5	8.6	64	46	14	-	269	590
	20	1:20 P	48	22	-	4.0	8.5	40	37	8	-	216	490
	21	2:15 P	106	23	-	4.4	8.3	50	22	0	1	176	410
	22	2:00 P	108	24	-	4.2	8.2	24	19	4	-	182	420
	23	11:30 A	96	22	-	4.2	8.7	39	25	3	-	208	470
	26	3:10 P	33	23	4.2	4.2	8.8	20	16	2	-	155	375
	27	12:45 P	25	21	-	4.1	8.9	26	16	1	-	153	365
	28	11:40 A	24	21	4.6	4.2	8.8	32	15	1	-	163	370
	29	10:40 A	29	21	4.8	4.5	8.4	23	16	0	1	163	370
	30	1:05 P	68	23	5.0	4.4	8.7	22	15	0	1	168	377
Maximum				24	5.0	4.5	8.9	64	46	14	1	269	590
Minimum				21	4.2	3.5	8.2	20	15	0	0	153	365
Average			55	22	4.7	4.2	8.6	34	23	3	0	185	424

APPENDIX A

MYC-24

CASSELMAN RIVER NEAR GRANTSVILLE, MD. AT RIVER RD. BRIDGE (RM 15.6-63.6-40.5)

DATE 1963		Sampling Time	Flow cfs	Temp. °C	pH		D.O. mg/1	As mg/1 of CaCO$_3$					CONDUCT.
								ACIDITY			ALK.	HARDNESS	
Mo.	Day				Field	Lab.		Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
Aug.	13	-	-	21	-	-	3.0	-	-	-	-	92	234
	14	4:30 P	-	18	-	-	7.0	-	-	-	-	97	213
	15	2:15 P	-	20	-	-	3.7	-	-	-	-	85	187
	16	2:10 P	-	24	-	6.2	5.9	0	5	-	21	64	147
	19	3:15 P	-	24	-	6.2	8.0	0	2	-	15	79	182
	20	1:55 P	-	20	-	6.2	7.1	Tr.	1	-	14	92	202
	21	3:00 P	-	22	-	5.8	6.7	3	2	-	15	88	195
	22	2:30 P	-	23	-	5.9	5.4	4	2	-	10	53	124
	23	10:55 A	-	19	-	6.0	4.3	1	13	-	12	74	175
	26	4:00 P	-	25	6.9	5.6	5.5	2	3	-	16	94	212
	27	12:15 P	-	24	-	6.4	6.9	2	6	-	15	96	215
	28	1:00 P	-	20	6.6	6.6	[illegible]	2	4	-	17	100	215
	29	9:40 A	-	15	6.5	6.5	2.9	5	8	-	22	96	235
	30	1:50 P	-	22	6.0	6.3	5.9	2	1	-	8	82	185
Maximum				25	6.9	6.6	7.1	4	18	-	22	100	235
Minimum				15	6.0	5.8	3.0	0	1	-	8	53	124
Average			13.5(est.)	21	6.5	6.2	5.7	2	5	-	15	85	194

APPENDIX A

DATE 1963								As mg/l of $CaCO_3$					
					pH			ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/l	Hot to Phenoth.	Cold to Phenoth.	Cold to M. O.	to M.O.	EDTA	micro-mhos
MYS-25 SNOWY CREEK NEAR CORINTH, W.VA. AT STATE LINE (RM 15.6-116.4-3.1)													
Aug.	13	12:45 P	-	18	-	-	7.5	-	-	-	-	49	123
	14	4:30 P	-	17	-	-	8.2	-	-	-	-	36	80
	15	5:00 P	-	16	-	-	9.4	-	-	-	-	38	93
	16	2:25 P	-	18	-	6.4	8.9	0	-	-	9	40	104
	21	2:30 P	-	20	-	6.6	8.2	2	4	-	18	36	84
	22	2:10 P	-	20	-	6.7	8.1	4	5	-	19	30	72
	23	10:45 A	-	18	-	6.7	8.1	3	4	-	11	34	80
	26	4:50 P	-	20	6.2	5.9	8.6	2	5	-	8	33	86
	27	3:00 P	-	20	6.8	5.8	9.0	3	6	-	4	42	100
	28	3:45 P	-	17	6.9	6.0	7.7	4	7	-	6	42	110
	29	2:30 P	-	17	6.5	6.8	7.2	18	9	-	22	43	100
	30	2:45 P	-	18	6.4	6.4	8.0	6	5	-	8	28	67
Maximum				20	6.9	6.8	9.0	18	9	-	22	49	123
Minimum				16	6.2	5.8	7.2	0	4	-	4	30	67
Average			36	18	6.6	6.4	8.3	4	6	-	12	38	92

APPENDIX A

DATE 1963								As mg/1 of $CaCO_3$					
					pH			ACIDITY			ALK.	HARDNESS	CONDUCT.
Mo.	Day	Sampling Time	Flow cfs	Temp. °C	Field	Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	to M.O.	EDTA	micro-mhos
					MYS-26 SNOWY CREEK NEAR CRELLIN, MD. (RM 15.6-116.4-1.0)								
Aug.	20	5:45 P	-	14	-	6.7	-	1	4	-	22	48	114
	21	1:30 P	-	19	-	6.2	8.0	4	3	-	15	34	81
	22	1:20 P	-	20	-	6.0	8.0	2	2	-	12	36	84
	23	11:25 A	-	18	-	7.3	8.1	3	2	-	11	30	73
	26	3:50 P	-	19	6.4	6.6	8.5	2	1	-	28	35	90
	27	1:50 P	-	16	7.1	6.6	8.9	2	3	-	7	35	90
	28	2:15 P	-	17	7.5	5.2	8.4	2	4	-	6	36	92
	29	3:45 P	-	17	5.3	5.3	8.1	11	5	-	5	37	101
	30	12:00 N	-	18	6.5	6.4	8.2	5	2	-	9	27	62
Maximum				20	7.5	7.3	8.9	11	5	-	28	48	114
Minimum				14	5.3	5.2	8.0	1	1	-	5	27	62
Average			36	18	6.6	6.3	8.3	4	3	-	13	35	87

APPENDIX A

DATE 1963 Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/1	As mg/1 of $CaCO_3$ ACIDITY Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos

MYSL-27
LAUREL RUN NEAR CRELLIN, MD. AT STATE LINE (RM 15.6-116.4-0.7-0.2)

Mo.	Day	Sampling Time	Flow cfs	Temp. °C	pH Field	pH Lab.	D.O. mg/1	Hot to Phenoth.	Cold to Phenoth.	Cold to M.O.	ALK. to M.O.	HARDNESS EDTA	CONDUCT. micro-mhos
Aug.	13	-	-	-	-	-	-	-	-	-	-	128	790
	14	3:30 P	-	18	-	-	6.5	-	-	-	-	44	212
	15	4:30 P	-	19	-	-	6.7	-	-	-	-	57	330
	16	1:55 P	-	20	-	3.5	7.1	78	70	40	-	64	435
	20	5:00 P	-	-	-	3.8	-	30	22	8	-	32	150
	21	1:45 P	-	19	-	3.9	7.0	47	43	16	-	46	255
	22	1:30 P	-	20	-	3.4	6.6	61	57	29	-	58	330
	23	11:20 A	-	19	-	3.4	6.7	69	64	46	-	66	400
	26	4:10 P	-	21	4.0	3.0	7.0	96	81	49	-	84	500
	27	2:15 P	-	20	3.2	3.1	7.5	105	104	57	-	69	530
	28	2:30 P	-	20	3.1	3.1	7.3	121	110	54	-	102	615
	29	4:00 P	-	18	4.2	4.2	7.5	18	16	1	-	26	96
	30	12:15 P	-	17	4.3	4.0	7.5	27	23	6	-	29	137
Maximum				21	4.3	4.2	7.5	121	110	57	-	128	790
Minimum				17	3.1	3.0	6.5	18	16	1	-	26	96
Average			20	19	3.8	3.5	7.0	65	59	31	-	64	368

APPENDIX A

DATE 1963 Mo.	 Day	Sampling Time	Flow cfs	Temp. °C	pH Field	 Lab.	D.O. mg/1	As mg/1 of $CaCO_3$ ACIDITY Hot to Phenoth.	 Cold to Phenoth.	 Cold to M.O.	 ALK. to M.O.	 HARDNESS EDTA	CONDUCT. micro-mhos
MTU-29 TURTLE CREEK IN TRAFFORD, PA. AT STEWART ST. BRIDGE (RM 11.5-7.0)													
Aug.	20	11:30 A	-	19	-	3.4	8.1	72	69	33	-	540	1650
	21	4:55 P	-	24	-	4.0	-	58	52	9	-	500	1510
	22	3:20 P	-	24	-	3.5	7.6	72	72	12	-	540	1620
	23	12:00 N	-	22	-	3.5	7.9	86	73	31	-	537	1640
	26	1:50 P	-	21	-	3.3	8.3	76	73	35	-	531	1680
	27	1:35 P	-	22	3.9	3.2	8.3	104	73	37	-	562	1725
	28	8:15 A	-	16	3.5	3.2	8.5	100	88	42	-	541	1700
	29	1:15 P	-	24	3.6	3.4	9.0	73	71	-	-	523	1620
	30	1:20 P	-	22	4.0	3.6	8.8	40	32	-	-	431	1350
Maximum				24	4.0	4.0	9.0	104	88	42	-	541	1725
Minimum				16	3.5	3.2	7.6	40	32	9	-	431	1350
Average				22	3.8	3.5	8.3	76	67	28	-	523	1610

APPENDIX B

INDIVIDUAL BIOLOGICAL FINDINGS

APPENDIX B

Bottom Organism Data - 1963

River Mile	Bottom Organisms Per Square Foot									Number of Kinds
	Midge	Sludgeworms	Caddisfly	Alderfly	Mayfly	Dragonfly	Stonefly	Misc.	Total	
MY- 15.6-44.4 Connellsville, Pa.	9	5	1	1	3	-	-	5	30	6
MY- 15.6-40.8	-	-	114	-	5	-	-	2	123	3
MY- 15.6-12.4	X	-	-	-	-	-	-	-	-	1 *
CASSELMAN RIVER										
MYC-15.6-63.6-40.5	1224	-	653	-	-	-	-	54	1931	8
MYC-15.6-63.6-36.6 State Line										
MYC-15.6-63.6-34.4	-	-	120	-	8	-	-	16	144	5
MYC-15.6-63.6-1.0	-	-	-	-	-	-	-	-	0	0

* Qualitative sample only.

APPENDIX B

Bottom Organism Data - 1963

River Mile	Bottom Organisms Per Square Foot									Number of Kinds
	Midge	Sludgeworms	Caddisfly	Alderfly	Mayfly	Dragonfly	Stonefly	Misc.	Total	
WEST FORK AND MONONGAHELA RIVER										
MW-128.7-66.0 Weston, W. Va.										
MW-128.7-55.0	13	-	47	-	8	-	-	24	92	12
MW-128.7-42.4	9	4	28	-	-	-	-	-	41	5
MW-128.7-20.0	18	9	-	-	-	-	-	-	27	3
MW-128.7- 4.4	8	1	-	7	-	-	-	-	16	4
MW-128.7- 0.2	58	-	-	2	-	-	-	-	60	2
MT-128.73 Tygart River										
M- 126.0	9	255	-	-	-	-	-	-	264	2
MB-125.4 Buffalo Creek										
MB-125.4-3.6	98	-	85	1	7	-	-	36	227	10
MB-125.4-2.5	20	16	-	1	2	-	-	10	49	11

APPENDIX B

Bottom Organism Data - 1963

River Mile	Bottom Organisms Per Square Foot									Number of Kinds
	Midge	Sludgeworms	Caddisfly	Alderfly	Mayfly	Dragonfly	Stonefly	Misc.	Totals	
M- 104.5	1	1	-	10	-	-	-	-	12	3
M- 94.2	5	29	-	1	-	2	-	-	37	4
M- 91.2 State Line										
M- 90.5	22	1	21	-	-	-	-	-	44	4
MC-89.4 Cheat River										
MD-87.1 Dunkard Creek										
MD-87.1-1.7	1181	-	-	2	-	-	-	-	1183	3
M- 85.8	37	1	1	1	-	-	-	-	40	4
M- 63.6	36	5	-	4	-	-	-	-	45	4
M- 44.0	21	12	-	-	-	1	-	-	34	3
M- 42.0 Charleroi, Pa.										
M- 15.6 Youghiogheny River										

APPENDIX B

Bottom Organism Data - 1963

River Mile	Bottom Organisms Per Square Foot									Number of Kinds
	Midge	Sludgeworms	Caddisfly	Alderfly	Mayfly	Dragonfly	Stonefly	Misc.	Totals	
TYGART RIVER										
MT-128.7-36.6 Phillipi, W. Va.	107	10	39	10	-	-	-	5	171	7
MT-128.7-18.6 Grafton, W. Va.	-	8	-	-	-	-	-	-	8	1
MT-128.7- 4.4	2	4	-	-	-	-	-	-	6	3
M-127.1 Fairmont, W. Va.										
CHEAT RIVER										
MCS-89.4-72.0-0.1 Shavers Fork	4	-	10	-	6	1	2	8	31	13
MCB-89.4-72.0-0.2 Black Water River	-	-	-	-	-	-	-	-	0	0
MC -89.4-72.0 Parsons, W. Va.										
MC -89.4-61.9	-	-	-	-	-	-	-	-	0	0
MC -89.4-40.9 Rowlesburg, W. Va.	-	-	-	-	-	-	-	-	-	7*
MC -89.4-27.7 Albright, W. Va.	2	-	-	-	-	-	-	-	2	1
MC -89.4- 2.9	20	-	-	-	-	-	-	-	20	1
M -89.4 Point Marion, Pa.										

APPENDIX B

Bottom Organism Data - 1963

River Mile	Bottom Organisms Per Square Foot									Number of Kinds
	Midge	Sludgeworms	Caddisfly	Alderfly	Mayfly	Dragonfly	Stonefly	Misc.	Total	
YOUGHIOGHENY RIVER										
MY- 15.6-119.5	-	-	14	3	2	-	-	1	20	5
MYS-15.6-116.4-6.1 Hopemont, W.Va.	16	16	236	-	100	-	-	4	372	11
MYS-15.6-116.4-3.1	-	-	-	-	-	-	-	-	0	0
MYS-15.6-116.4-2.2 State Line										
MYS-15.6-116.4-1.0	5	-	3	1	2	-	-	-	11	4
MYSL-15.6-116.4-0.7-0.2	-	-	-	-	-	-	-	-	0	0
MY- 15.6-111.7 Oakland, Md.	37	2	5	-	-	-	-	-	44	5
MY- 15.6-84.6	4	1	53	2	31	-	4	3	98	15
MY- 15.6-78.6 State Line										
MY- 15.6-68.9	23	1	54	-	4	-	2	1	85	12
MY- 15.6-63.6 Casselman Cr.										
MY- 15.6-62.9	-	-	-	-	-	-	-	-	0	0

APPENDIX C

BACTERIOLOGICAL DATA

APPENDIX C

MONONGAHELA RIVER BASIN
Bacteriological Data

Station	River Mile	pH	No. of Samples	T. Coli per 100/ml	F. Strep per 100/ml		Calculated T.Coli MPN/100 ml 30% Flow
M-1	M- 41.4	4.2	5	2,200	2,100	Max.	43,000
				1,480	480	Avg.	
				760	6	Min.	
M-2B	M- 70.7	3.8	4	1,700	14	Max.	14,000
				837	4	Avg.	
				270	< 1	Min.	
M-3	M- 85.0	3.9	9	210	260	Max.	34,500
				120	60	Avg.	
				10	< 2	Min.	
M-4	M- 90.7	3.9	9	300	1,000	Max.	313,000
				150	150	Avg.	
				20	< 2	Min.	
M-5	M- 98.0	4.1	9	1,400	210	Max.	308,000
				540	60	Avg.	
				90	10	Min.	
M-6	M-124.6	5.8	5	500	1,400	Max.	298,000
				440	400	Avg.	
				380	50	Min.	
MD-7	MD-87.1-3.5	2.8	9	10	1,200	Max.	-
				3	150	Avg.	
				< 2	< 2	Min.	

MONONGAHELA RIVER BASIN
Bacteriological Data

Station	River Mile	pH	No. of Samples	T. Coli per 100/ml	F. Strep per 100/ml		Calculated T.Coli MPN/100 ml 30% Flow
MB- 8	MB-125.4-3.0	7.4	9	800,000	9,000	Max.	
				205,000	6,510	Avg.	-
				18,000	520	Min.	
MW- 9	MW-128.7-4.4	4.7	9	23,000	120,000	Max.	
				6,010	20,780	Avg.	520,000
				< 100	< 1	Min.	
MW-10	MW-128.7-20.0	3.3	5	10	39	Max.	
				5	10	Avg.	1,657,000
				< 100	< 1	Min.	
MW-11	MW-128.7-31.9	7.0	5	3,100	4,200	Max.	
				2,300	970	Avg.	18,000
				1,500	92	Min.	
MT-12	MT-128.7- 4.9	5.8	9	4,700	100,000	Max.	
				1,720	24,820	Avg.	-
				< 100	< 10	Min.	
MT-13	MT-128.7-18.6	5.7	5	130	860	Max.	
				60	180	Avg.	-
				< 100	3	Min.	
MC-14	MC- 89.4- 3.5	4.5	9	100	150	Max.	
				40	20	Avg.	-
				< 10	1	Min.	

MONONGAHELA RIVER BASIN
Bacteriological Data

Station	River Mile	pH	No. of Samples	T. Coli per 100/ml	F. Strep per 100/ml		Calculated T.Coli MPN/100 ml 30% Flow
MC-15	MC-89.4- 9.3	5.5	9	150	170	Max.	-
				90	40	Avg.	
				30	< 1	Min.	
MC-16	MC-89.4-27.7	6.6	9	20,000	230,000	Max.	-
				7,110	43,520	Avg.	
				150	< 10	Min.	
MC-17	MC-89.4-45.0	7.0	5	10,000	1,800	Max.	-
				6,750	440	Avg.	
				3,500	3	Min.	
MY-18	MY-15.6-12.4	5.6	5	180	< 10	Max.	-
				115	< 7	Avg.	
				50	< 1	Min.	
MY-19	MY-15.6-44.4	6.5	9	1,900	770	Max.	-
				680	200	Avg.	
				100	20	Min.	
MY-190	MY-15.6-58.7	6.8	4	6,200	2,100	Max.	-
				1,970	810	Avg.	
				180	78	Min.	
MY-20	MY-15.6-68.9	6.5	5	440	430	Max.	-
				420	110	Avg.	
				400	< 1	Min.	

APPENDIX C

MONONGAHELA RIVER BASIN
Bacteriological Data

Station	River Mile	pH	No. of Samples	T. Coli per 100/ml	F. Strep per 100/ml		**Calculated T.Coli MPN/100 ml 30% Flow**
MY- 21	**MY-** 15.6-76.6	6.8	9	9,000 4,060 370	90,000 20,610 < 1	**Max.** Avg. Min.	-
MY- 210	**MY-** 15.6-111.9	6.6	9	350,000 88,670 5,000	168,000 34,530 70	Max. Avg. Min.	-
MY- 22	**MY-** 15.6-119.5	7.0	9	47,000 18,570 2,800	55,000 17,150 49	**Max.** Avg. Min.	-
MYC-23	**MYC**-15.6-63.6-1.0	4.4	9	16,000 3,220 10	61,000 71,030 < 1	**Max.** Avg. Min.	-
MYC-24	**MYC**-15.6-63.6-40.5	6.7	9	190,000 88,670 50,000	300,000 71,030 40	**Max.** Avg. Min.	-
MYS-25	**MYS**-15.6-116.4-3.1	6.3	9	54,000 12,720 < 10	220,000 34,020 < 1	**Max.** Avg. Min.	
MYS-26	**MYS**-15.6-116.4-1.0	6.6	5	33,000 17,550 2,100	4,400 1,500 57	Max. Avg. Min.	-
MYSL-27	**MYSL**-15.6-116.4-0.7-0.2	3.6	9	1,400 430 40	9,000 2,110 < 1	**Max.** Avg. Min.	-

APPENDIX D

INDUSTRIES

APPENDIX D

MONONGAHELA RIVER BASIN INDUSTRIES

LOCATION	INDUSTRY	RECEIVING STREAM	RIVER MILE	TYPE INDUSTRY	TREATMENT PROVIDED
Meriden, W. Va.	Badger Coal Co.	Fords Run-Tygart R.	MT-128	Coal Washing	Inadequate*
Barrackville, W. Va.	Bethlehem Mines Corp.	Buffalo Creek	MB-127- 3	Coal Washing	-*
Idamay, W. Va.	Bethlehem Mines Corp.	Helena Run	M-128	Coal Washing	-*
Granville, W. Va.	Christopher Coal Co.	Monongahela R.	M-	Coal Washing	-*
Maidsville, W. Va.	Christopher Coal Co.	Monongahela R.	M- 98	Coal Washing	-*
Buckhannon, W. Va.	Bridge Run Coal Co.	Buckhannon R.	MTB-128-47-20	Coal Washing	-*
Dola, W. Va.	Clinchfield Coal Co. (No.1)	Ten Mile Cr.	MWT-128-19-1	Coal Washing	-*
Phillipi, W. Va.	Clinchfield Coal Co.	Elk Cr.	MWE-128-43-30	Coal Washing	-*
Dola, W. Va.	Clinchfield Coal Co. (No.3)	L. Ten Mile Cr.	MWT-128-19-1	Coal Washing	-*
Dola, W. Va.	Corhart Refractories	Buckhannon R.	MTB-128-47	Misc. Mfg.	-*
Morgantown, W. Va.	Deckers Creek Sand Co.	Deckers Cr.	M- 101	Misc. Mfg.	-*
Grant Town, W. Va.	Eastern Associated Coal Corp.	Paw Paw Cr.	MP-122-5	Coal Washing	-*
Dawmont, W. Va.	Galloway Land Co.	West Fork R.	MW-128	Coal Washing	-*
Hodgesville, W. Va.	Hackers Creek Coal Co.	Hackers Cr.	MWH-128-50-25	Coal Washing	-*

APPENDIX D

MONONGAHELA RIVER BASIN INDUSTRIES

LOCATION	INDUSTRY	RECEIVING STREAM	RIVER MILE	TYPE INDUSTRY	TREATMENT PROVIDED
Rachel, W. Va.	Joanne Coal Co.	Buffalo Cr.	MB-127	Coal Washing	Inadequate*
Clarksburg, W. Va.	McNichol, D.E.Pottery Co.	West Fork R.	MW-128-32	Misc. Mfg.	-*
Spelter, W. Va.	Mathiessen & Hegeler Zinc Co.	West Fork R.	MW-128-23	Misc. Mfg.	Inadequate*
Stringer, W. Va.	Mountaineer Coal Co.	Bingamon Cr.	MW-128	Coal Washing	-*
Owings, W. Va.	Mountaineer Coal Co.	Mudlick Run	MW-128	Coal Washing	-*
Jordan, W. Va.	Mountaineer Coal Co.	Monongahela R.	M-	Coal Washing	-*
Farmington, W. Va.	Mountaineer Coal Co.	Buffalo Cr.	MB-127- 8	Coal Washing	-*
Fairview, W. Va.	Mountaineer Coal Co.	Sugar Run	MP-122-11	Coal Washing	-*
Hodgesville, W. Va.	Pecks Run Coal Co.	Pecks Run		Coal Washing	-*
Cascade, W. Va.	Preston County Coke Co.	Deckers Cr.	MD-101-12	Misc. Mfg.	-*
Dola, W. Va.	Robey Run Coal Co.	L. Ten Mile Cr.	MWT-128-19-1	Coal Washing	-*
Four States, W. Va.	Rochester & Pittsburgh Coal Company	Tevebaugh Cr.	MW-128	Coal Washing	-*
Irona, W. Va.	Chapel Coal Co.	Cheat R.	MC- 89-45	Coal Washing	-*
Gage, W. Va.	Gage Coal Co.	Buffalo Cr.	MB-127	Coal Washing	-*
Howesville, W. Va.	Kray Coal Co.	Three Forks Cr.	MTTF-128-18 -10	Coal Washing	-*

APPENDIX D

MONONGAHELA RIVER BASIN INDUSTRIES

LOCATION	INDUSTRY	RECEIVING STREAM	RIVER MILE	TYPE INDUSTRY	TREATMENT PROVIDED
Lost Creek, W. Va.	Petitto Bros. Coal Co.	Lost Creek	MWL 128-40-4	Coal Washing	Settling
Clarksburg, W. Va.	Carnation Milk Co.	Limestone Run, West Fork R.	MW 128-30	Milk Prod.	Aeration, T.F.
Galloway, W. Va.	Simpson Creek Collieries	Simpson River	MW 128-23-18	Coal Washing	None
Salem, W. Va.	Compass Coal Co.	Ten Mile Creek	MWT 128-19-5	Coal Washing	Pond
Monongah, W. Va.	Consolidation Coal Co.	West Fork R.	MW 128-5	Coal Washing	Settling
Huttonsville, W. Va.	Carnation Milk Co. Rec.Sta.	Tygart R.	MT 128-101	Milk Prod.	None
Buckhannon, W. Va.	Reppert-Fairmont Coal Co.	Buckhannon R.	MTB 128-47-20	Coal Washing	Pond
Century, W. Va.	Bethlehem Mines Corp.	Buckhannon R.	MTB 128-47-10	Coal Washing	Pond
Fairmont, W. Va.	Reilly Tar & Chemical Corp.	Monongahela R.	M 127	Misc.	Oil & Tar Sep.
Fairmont, W. Va.	Sharon Steel Corp.	Monongahela R.	M 127	By-prod. Coke	Extractor
Farmington, W. Va.	Jamison Coal & Coke Co.	Buffalo Creek	MTB 127-8	Coal Washing	Sludge Thickener

APPENDIX D

MONONGAHELA RIVER BASIN INDUSTRIES

LOCATION	INDUSTRY	RECEIVING STREAM	RIVER MILE	TYPE INDUSTRY	TREATMENT PROVIDED
Rivesville, W. Va.	Monongahela Power Co.	Monongahela R.	M 125	Misc.Mfg.Ind.	Settling
Everettville, W. Va.	Consolidation Coal Co.	Indian Creek	MI 118-1	Coal Washing	Settling
Morgantown, W. Va.	Mathieson Chemical Co.	Decker Creek	MD 101-0.5	Chemicals	Settling
Morgantown, W. Va.	Sterling Faucet Co.	Decker Creek	MD 101-0.5	Non-ferrous Metals	Partially connected to City Sewer
Cassville, W. Va.	Christopher Coal Co.	Scotts Run	MS 99-5	Coal Washing	None
Maidsville, W. Va.	Rosedale Coal Co.	Monongahela R.	M 98	Coal Washing	Settling
Parsons, W. Va.	Armour Leather Co.	Black Fork, Cheat R.	MC 89-78	Tanning	Settling
Parsons, W. Va.	Dorman Mills	Cheat R.	MC 89-78	Textile Mill Prod.	None
Albright, W. Va.	Englehart Woolen Mill Co.	Cheat R.	MC 89-35	Textile Mill Prod.	Septic Tank
Albright, W. Va.	Monongahela Power Co.	Cheat R.	MC 89-35	Misc.Mfg.Ind.	Settling

APPENDIX D

MONONGAHELA RIVER BASIN INDUSTRIES

LOCATION	INDUSTRY	RECEIVING STREAM	RIVER MILE	TYPE INDUSTRY	TREATMENT PROVIDED
Point Marion, Pa.	L. J. House Convex Glass Co.	Monongahela R.	M- 89	Misc. Mfg.	Settling
Wayne Twp., Pa.	Peoples National Gas Co.	Dunkard Cr.	MD- 87-14	Misc. Mfg.	Complete
Bobtown, Pa.	Shannopin Coal Co.	Dunkard Cr.	MD- 87-6	Sanitary	Primary
Nemacolon, Pa.	Buckeye Coal Co.	Monongahela R.	M- 75	-	-*
W. Bethlehem Twp., Pa.	Bethlehem Mines Co.	Ten Mile Cr.	MTM-66-10	-	-*
N. Union Twp., Pa.	Malsbury Mfg. Co.	Redstone Cr.	MR- 55-16	Misc. Mfg.	Secondary
"	Hopwood Lumber Co.	"	"	Misc. Mfg.	Primary
"	Uniontown Indus.Enterpr.Co.	"	"	-	-*
"	Simpson Towel Co.	"	"	Misc. Mfg.	Primary
Dunbar Twp., Pa.	Liberty Powder Co.	"	MR- 55-13	Chemicals	Septic Tank
W. Pike Run Twp., Pa.	Crescent Mine	Pike Run	MP- 51-6	Mining	Primary
W. Pike Run Twp., Pa.	Clyde S. Robinson Dairy	Pike Run	MP- 51-6	Dairy	Secondary
Howell Sore, Pa.	Allied Chemical Co.	Monongahela R.	M- 51	Chemicals	Primary
Allenport, Pa.	Pittsburgh Steel Co.	"	M- 46	Metal Prod.	Primary
Charleroi, Pa.	Corning Glass Works	"	M- 41	Misc. Mfg.	Primary

APPENDIX D

MONONGAHELA RIVER BASIN INDUSTRIES

LOCATION	INDUSTRY	RECEIVING STREAM	RIVER MILE	TYPE INDUSTRY	TREATMENT PROVIDED
Monessen, Pa.	American Chain & Cable Co.	Monongahela R.	M- 39	Pickling	None
Donora, Pa.	American Steel Wire Co.	Monongahela R.	M- 34	Metal Prod.	Primary
W. Bethlehem, Twp., Pa.	J. & L. Donahue	Ten Mile Cr.	MTM-66-10	-	-*
Jefferson, Pa.	Detroit Steel Prod. Co.	Ten Mile Cr.	MTM-66-6	-	-*
N. Bethlehem Twp., Pa.	J. & L. Steel Corp.	Ten Mile Cr.	MTM-66-5	-	Secondary
N. Bethlehem Twp., Pa.	Vesta Coal Co. #1	Ten Mile Cr.	MTM-66-5	-	Secondary
N. Bethlehem Twp., Pa.	Vesta Coal Co. #2	Ten Mile Cr.	MTM-66-5	-	Secondary
E. Bethlehem Twp., Pa.	Clyde #3	Ten Mile Cr.	MTM-66-3	-	-*
Center Twp., Pa.	Equitable Gas Co.	S.F.Ten Mile Cr.	MTM-66-2-22	Refinery	Settling
Jefferson Twp., Pa.	C.W.Acklin Sand Quarries	S.F.Ten Mile Cr.	MTM-66-2- 3	Mining	Secondary
Jefferson Twp., Pa.	West. Penn. Power	S.F.Ten Mile Cr.	MTM-66-2- 3	Misc. Mfg.	Primary
Jefferson Twp., Pa.	Clyde #2	S.F.Ten Mile Cr.	MTM-66-2- 3	-	-*
Luzerne Twp., Pa.	J. & L. Steel Corp.	Monongahela R.	M- 66	-	-*
Brownsville, Pa.	Park & Tilford Dist. Inc.	Monongahela R.	M- 56	Distillery	Primary
S. Union Twp., Pa.	French Dyers & Cleaners	Redstone Cr.	MR-55-18	Misc. Mfg.	None
N. Union Twp., Pa.	Texas Eastern Trans. Co.	Redstone Cr.	MR-55-16	-	-*

APPENDIX D

YOUGHIOGHENY RIVER SUB-BASIN INDUSTRIES

LOCATION	INDUSTRY	RECEIVING STREAM	RIVER MILE	TYPE INDUSTRY	TREATMENT PROVIDED
Elk Lick Twp., Pa.	Amos J. Yoder Co.	Casselman R.	MYC-15-70-44	Slaughtering	Secondary
Brothers Valley Twp.,Pa.	Meadow Gold Dairies	Buffalo Cr.	MYCB-15-70-28-8	Milk Receiving	Regulated Discharge
Somerset, Pa.	The DeVilbiss Co.	Coxes Cr.	MYCC-15-70-22-9	Metal Prod.	Secondary
Somerset, Pa.	A. W. Francis Co.	Coxes Cr.	MYCC-15-70-22-9	Plating	Secondary
Somerset Twp., Pa.	Somerset Beef & Prov. Co.	Coxes Cr.	MYCC-15-70-22-7	Slaughtering	None
Somerset Twp., Pa.	Somerset Canning Corp.	Coxes Cr.	MYCC-15-70-22-7	Canning	Lagoons
Stewart Twp., Pa.	Union Fire Brick Co.	Meadow Run	MYM- 15-62	Industrial	Complete
Dunbar Twp., Pa.	Interstate Amiesite Co.	Dunbar Cr.	MYD- 15-44-3	Industrial	Complete
Dunbar Twp., Pa.	Koppers Co.	Youghiogheny R.	MY- 15-44	Chemicals	Lagoons
Connellsville, Pa.	B. & O. Railroad	Youghiogheny R.	MY- 15-42	Industrial	Secondary
Connellsville Twp., Pa.	A. Overholt & Co.	Youghiogheny R.	MY- 15-42	Industrial	Complete
Bullskin Twp., Pa.	West Penn. Power Co.	Mounts Cr.	MYM-15-42-5	Industrial	Secondary
Hempfield Twp., Pa. Carbon Area, S.T.P.	Alfery Co.	Jacks Run	MYSJ-15-17-17-8	Slaughtering	Septic Tank to Lagoon
Hempfield Twp., Pa. Carbon Area, S.T.P.	M. Lepidi & Sons	Jacks Run	MYSJ-15-17-17-8	Slaughtering	Secondary
Hempfield Twp., Pa. Carbon Area, S.T.P.	J. E. Wineman Slaughterhouse	Jacks Run	MYSJ-15-17-17-8	Slaughtering	None

APPENDIX D

YOUGHIOGHENY RIVER SUB-BASIN INDUSTRIES

LOCATION	INDUSTRY	RECEIVING STREAM	RIVER MILE	TYPE INDUSTRY	TREATMENT PROVIDED
Greensburg, Pa.	Goldberg Provision Co.	Jacks Run	MYSJ-15-17-17-6	Slaughtering	None
Greensburg, Pa.	Railway & Indus. Eng.	Jacks Run	MYSJ-15-17-17-6	Industrial	None
S. W. Greensburg, Pa.	Pittsburgh Plate Glass Co.	Jacks Run	MYSJ-15-17-17-6	Industrial	Secondary
S. W. Greensburg, Pa.	Mercalier Mfg. Co.	Jacks Run	MYSJ-15-17-17-6	Industrial	Primary
S. W. Greensburg, Pa.	Walworth Co.	Jacks Run	MYSJ-15-17-17-6	Industrial	Primary
Youngwood, Pa.	Robertshaw-Fulton Controls	Jacks Run	MYSJ-15-17-17-1	Plating - Pickling	Secondary
Sewickley Twp., Pa.	John Badanjck	Sewickley Cr.	MYS- 15-17-6	Slaughtering	None
Sewickley Twp., Pa.	Westinghouse	Sewickley Cr.	MYS- 15-17-6	Domestic	Primary
Mt. PleasantTwp., Pa.	F. L. Ferrari	Shupes Run	MYSS-15-27-15-3	Petroleum	Secondary
Mt. Pleasant Twp., Pa.	Will G. Keck	Shupes Run	MYSS-15-27-15-3	Food Products	Septic Tank
E. Huntington Twp., Pa.	Click Bros. Co.	Jacobs Cr.	MYJ- 15-27-12	Slaughtering	Septic Tank
E. Huntington Twp., Pa.	E. B. Hostofer Co.	Jacobs Cr.	MYJ- 15-27-12	Slaughtering	None
E. Huntington Twp., Pa.	Smelke Bros. Co.	Jacobs Cr.	MYJ- 15-27-12	Slaughtering	None

APPENDIX D

YOUGHIOGHENY RIVER SUB-BASIN INDUSTRIES

LOCATION	INDUSTRY	RECEIVING STREAM	RIVER MILE	TYPE INDUSTRY	TREATMENT PROVIDED
E. Huntington Twp., Pa.	Penn. Screw & Bolt Co.	Jacobs Creek	MYJ-15-27-12	Metal Prod.	Secondary
E. Huntington Twp., Pa.	Bryce Bros.	Jacobs Creek	MYJ-15-27-12	Industrial	None
Scottdale, Pa.	The Duraley Co.	Jacobs Creek	MYJ-15-27-11	Metal Prod.	None
Scottdale, Pa.	Ruth Lambert Supply Co.	Jacobs Creek	MYJ-15-27-11	Lumber	None
Smithton, Pa.	Jones Brewing Co.	Youghiogheny R.	MY- 15-24	Brewery	None
West Newton, Pa.	Fusee Co.	Youghiogheny R.	MY- 15-18	Industrial	Complete
Hempfield Twp., Pa. Carbon Area S.T.P.	Silvis Farms, Inc.	Jacks Run	MYSJ-15-17-17-8	Milk Receiving	Complete
Hempfield Twp., Pa. Carbon Area S.T.P.	Westmoreland Glass Co.	Jacks Run	MYSJ-15-17-17-8	Industrial	Complete

* Unknown

MR. SIDIO: That concludes my report, Mr. Chairman.

MR. STEIN: Thank you, Mr. Sidio.

Are there any comments or questions?

MR. WRIGHT: Mr. Chairman.

MR. STEIN: Yes.

MR. WRIGHT: I have a question concerning the omission of a statement under effects of pollution.

> "The calculated coliform densities indicate a health hazard in the use of the Monongahela as a source of domestic water supply and for recreation."

I am wondering if that was intentional, or is it an oversight?

MR. STEIN: Will you identify the page?

MR. WRIGHT: Page 4, the end of the second paragraph.

MR. STEIN: By the way, while you are looking it up, as I understood, the whole report would appear in the record as read.

MR. WRIGHT: I see.

MR. STEIN: But you go ahead.

MR. SIDIO: All right.

On Page 4, this was not changed. Did I read it differently?

MR. WRIGHT: You did not read the sentence, "The calculated coliform densities indicate a health hazard."

MR. SIDIO: Yes, I did. I changed its position. That's all.

MR. WRIGHT: Did you?

MR. SIDIO: Yes.

MR. WRIGHT: My next question is: The Public Health Service is responsible for approval of interstate carriers, is it not -- approval of the water supplies for use in interstate carriers?

MR. SIDIO: Yes.

MR. WRIGHT: Has there been any action taken in regard to approval or disapproval of the interstate carriers of municipal water supplies in the Monongahela River Basin?

MR. SIDIO: I don't know. I am not involved in that part of it. There may be someone here who can answer that question, but I cannot answer it.

MR. STEIN: Do you have any other comments or questions?

MR. WRIGHT: No.

DR. WILBAR: Mr. Chairman, I have a few comments.

I would like to congratulate Mr. Sidio on the beautiful charts which illustrate his points quite well.

A. D. Sidio

I think we all are aware that the Public Health Service report is based on a few weeks of field study, during which relatively few samples were collected. The report was made after the notice of this hearing, which was sent out on August 7th.

A good deal of the data was collected from the various States, but there is some obsolete and inaccurate data on industrial wastes, and some inaccurate data on industrial water supplies. For instance, the Public Health Service report indicates that the industrial wastes in the Basin constitute about six billion gallons a day. We feel that the correct figure is closer to two and a half billion gallons a day.

Their report was based on a questionnaire sent out three or four years ago, and we feel that some of the statistics obtained therein were not accurate. We will be glad to help to straighten that out.

Since the Allegheny County line was chosen as the report's stopping point in the consideration of the Monongahela River, it does present an incomplete picture of the water quality of the river.

There are a number of points which we believe to be somewhat inaccurate or misleading, but I don't want to do any more than give a few illustrations, or to get into a few of these points. I do not now want us to take time to have a long debate on some of these things, because, if we did we might be here far, far into the night.

However, let me just point out a few points. On Pages 2, 4 and 23, it is stated that mine drainage pollution makes the Monongahela unfit for recreational uses such as fishing, boating and swimming. This is not consistent with our knowledge of the river and other statements actually in the report.

The river is used extensively for boating, and is also used in places for fishing and swimming.

On Pages 2 and 15 of the report, it is indicated that the river is used for water-based recreation, so we feel that the statement saying the river is unfit for these uses is too strong. It should be amended to say that mine drainage adversely affects these uses.

Table 3, "Estimated Coliform Bacterial Loads of Streams, 1963," does nt include an allowance for chlorination of sewage effluent at treatment plants in Pennsylvania in the estimates. Now, this error has an appreciable effect on the estimates.

Table 3 lists Uniontown, Pennsylvania, as providing secondary treatment. Uniontown provides only primary treatment.

The information used for the table in the

Monongahela River Basin industries is obsolete and inaccurate and there are quite a few errors, but possibly our Table 6 should be substituted there.

It is mentioned that the study of the reclassification of the Monongahela main stream by the Pennsylvania Department of Health, Sanitary Water Board, began in 1962. Actually, it began in the summer of 1961.

These are just a few inaccuracies which are bound to occur in a report that has to be done quite quickly on a comprehensive subject. I just thought that perhaps for the record we should point out some of them.

MR. STEIN: Mr. Sidio, do you care to comment on that, please?

MR. SIDIO: I have no particular comments. However, I would say that a large part of the information that you have quoted to me, Doctor, as having been or being incorrect, was provided by your State Health Department.

DR. WILBAR: Well, I think that actually your Department and ours would have to sit down together, but I do think we have the accurate data.

It is apparently a matter of interpretation here. I mean, we are very familiar with this stream, and I think we can see that the accurate figures are included in the report.

MR. STEIN: Thank you, Doctor.

By the way, I think I might make one comment here, Doctor. I heard your excellent report on Pennsylvania, and the West Virginia report, and have heard this one. I think there is a substantial area of agreement on the physical facts that all the reports agreed on.

DR. WILBAR: Yes.

MR. STEIN: Although your points are well taken, we can deal with these points later.

DR. WILBAR: That's right. I don't want to belabor this point.

I do think that the fact that there is some disagreement on certain of the statistics means that we don't all agree that there is pollution here that needs further working on and correction in a cooperative manner.

MR. STEIN: Mr. Shaw?

MR. SHAW: Mr. Chairman, I would like to call on Mr. Robert Boes, Sanitary Engineer of the ORSANCO staff, to comment.

MR. STEIN: Would you like to come up here?

STATEMENT OF R. J. BOES, SANITARY ENGINEER, ORSANCO

MR. BOES: Mr. Chairman, conferees, ladies and gentlemen:

These comments are to indicate the area and scope of the technical questions regarding this report.

R. J. Boes

It is felt that a detailed technical discussion would be of interest to some of us, but that such discussion would not assist the conferees in evaluating the programs and the needs for water pollution control in the Monongahela River Basin.

Under sources of pollution, these have been noted. There are discrepancies between the HEW report and the information supplied by the States of West Virginia and Pennsylvania with regard to sources of municipal and industrial pollution.

Presumably, information supplied by the States at these proceedings will be used as a basis for correcting the HEW report in order that such discrepancies may be eliminated.

Mine drainage: To supplement the statement on the mine drainage problems made by Chairman Shaw, we wish to submit for inclusion in the record a copy of ORSANCO Resolution No. 5-60. This sets forth mine drainage control measures that have been adopted by the signatory States and that are now being put into practice.

We also wish to submit for the record a manual titled, "Principles and Guide to Practices in The Control of Acid Mine Drainage Supplemented by Case Histories."

This manual was prepared by the Coal Industry

Advisory Committee and approved by the Commission as an aid in applying control measures.

The point should be made that caution is needed in applying figures contained in the HEW report on monetary damage due to mine drainage.

Waters of the Monongahela River and its tributaries are now being used as a source of supply for municipal and industrial purposes. Conventional treatment of these waters applicable to all surface waters normally, clarification, filtration, stabilization and disinfection, can produce treated water supplies which meet the United States Public Health Service drinking water standards.

As noted by Mr. Wright, there is probably no record of any supply in the Monongahela Basin being classified by the United States Public Health Service as unsatisfactory for interstate water use for their interstate carriers.

Biological population: The HEW report shows that biological conditions at interstate points are not far different from conditions in other parts of the Monongahela Valley for the effects of mine drainage, as indicated by a pH, which do not exist. Streams in the Monongahela River Basin that are not affected by acid are low in dissolved salts content, are poorly buffered and relatively infertile.

Therefore, even if acid conditions were eliminated, it may be presumed that biological populations in the Monongahela River System would be relatively low in comparison with similar populations in other areas.

Bacteriological quality: The HEW report postulated that a health hazard in terms of high coliform counts exists at interstate points during times of high river flow. The reasoning offered is that at times of high flow, mine acid drainage will be diluted, with a consequent increase in pH and a reduction in the bacterial side effects of the acid.

This theory is not validated by available data. A study by ORSANCO was made of the pH flow in relationship in the Monongahela River at Point Marion. A continuous record of some eight years from the United States Geological Survey monitoring station at Point Marion shows that the increase in flow does not result in a significant increase in pH.

The review of the coliform data in the West Virginia network samples, which cover a period of three years at the station immediately above Point Marion, shows that at no time, regardless of the level of the river flow, does the coliform increase to any significant degree over those shown in the HEW report.

The HEW report further postulates that high coliform counts will occur under non-acid conditions -- that is, under conditions when all acid mine drainage has been eliminated.

Calculations are presented showing what the counts might theoretically be under such conditions, but the waste treatment requirements today on the theoretical assumption of non-acid conditions would, we believe, be unrealistic.

There is every reason to believe, on the basis of reports made by the States of Pennsylvania and West Virginia, that by the time the acid is eliminated, sewage treatment facilities will be adequate to meet the needs.

In 1959, the Ohio River Commission issued a report in cooperation with the States of Pennsylvania and West Virginia regarding sewage treatment requirements for the Monongahela River.

I wish to submit a copy of that report for inclusion in the record of these proceedings.

Conclusions expressed in the 1959 report are as follows:

> "Treatment of existing sewage discharges to the Monongahela River in accordance with the minimum degree of treatment specified in the Ohio Valley Compact should insure

"the maintenance of adequate sanitary quality, as measured by bacteriological parameters and dissolved oxygen conditions at points of interstate concern."

"The State of West Virginia and the Commonwealth of Pennsylvania may wish to establish sewage treatment requirements higher than the compact minimum in order to achieve satisfactory conditions insofar as intrastate interests are concerned."

On the basis of the information presented at this conference, these conclusions reached by ORSANCO in 1959 are still valid.

MR. STEIN: Do you have a copy of that report you want to submit now?

MR. BOES: The submission is the ORSANCO resolution.

MR. STEIN: Without objection, those will be received.

How about printing the resolution as part of the record, and keeping the reports as part of the file? Would that be satisfactory, or do you want the reports printed too?

MR. BOES: The reports are available for

distribution.

MR. STEIN: Thank you.

(The reports referred to will be found in the files of the Department.)

(Resolution No. 5-60 of ORSANCO is as follows:

OHIO RIVER VALLEY WATER SANITATION COMMISSION
An interstate agency representing: ILLINOIS, INDIANA, KENTUCKY, NEW YORK, OHIO, PENNSYLVANIA, VIRGINIA, WEST VIRGINIA

414 Walnut Street Cincinnati 2, Ohio

RESOLUTION NO. 5-60, AMENDED
Acid Mine-Drainage Control Measure
Adopted January 14, 1960
Amended January 10, 1963

WHEREAS: By resolution adopted on the 6th day of April, 1955, the Ohio River Valley Water Sanitation Commission promulgated a statement of policy and procedures for the control of industrial-waste discharges into waters included within its jurisdiction by the terms and provisions of the Ohio River Valley Water Sanitation Compact; and

WHEREAS: Waters of the Ohio River Valley Water Sanitation District are being polluted by acid discharges from coal mining and related operations, hereinafter referred to as "acid mine-drainage," contrary to the language and intent of the Ohio River Valley Water Sanitation Compact; and

WHEREAS: It has been demonstrated that the conscientious application of certain principles and practices will, under certain conditions, alleviate the pollution from acid mine-drainage;

NOW, THEREFORE: In furtherance of the policy and procedures as above set forth and for the general purpose of contributing to the achievement of the objectives specified in Article I of the Ohio River Valley Water Sanitation Compact;

BE IT RESOLVED: That the following measures are hereby adopted by the Commission for the control of acid mine-drainage pollution in the Ohio River Valley Water Sanitation District and pursuant to the statement of policy and procedures are to be followed by the signatory states:

R. J. Boes

I. (a) Surface waters and ground waters shall be diverted where practicable to prevent the entry or reduce the flow of waters into and through workings.

(b) Water that does gain entry to the workings shall be handled in a manner which will minimize the formation and discharge of acid mine drainage to streams.

II. Refuse from the mining and processing of coal shall be handled and disposed of in a manner which will minimize discharge of acid mine-drainage therefrom to streams. Where acid-producing materials are encountered in the overburden in stripping operations, these materials shall be handled so as to prevent or minimize the production of acid mine-drainage, taking into consideration the need for stream pollution prevention and all economic factors involved.

III. Discharge of acid mine-drainage to streams shall be regulated insofar as practicable to equalize the flow of daily accumulations throughout a 24-hour period.

IV. Upon discontinuance of operations of any mine all practicable mine-closing measures, consistent with safety requirements, shall be employed to minimize the formation and discharge of acid mine-drainage.

V. Under appropriate circumstances, consideration shall be given to the treatment of acid mine-drainage by chemical or other means in order to mitigate its pollutional properties.

Nothing stated in this control measure shall be construed to relieve any municipality, corporation, person or other entity from responsibility for compliance with existing Federal, State and local laws and regulations.

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* * *

MR. STEIN: Mr. Sidio, do you have any comment in relation to Mr. Boes' remarks?

MR. SIDIO: I do not have any particular point to make Mr. Chairman.

MR. STEIN: Mr. Shaw?

MR. SHAW: Do you have anything further to state, Mr. Boes?

MR. BOES: No. That completes the statement.

MR. SHAW: I believe that is all on behalf of ORSANCO:

MR. STEIN: Mr. Anderson?

MR. ANDERSON: I would like now to call on the representative from the Department of the Interior.

STATEMENT OF G. W. JOSEPHSON, BUREAU OF MINES, DEPARTMENT OF THE INTERIOR

MR. JOSEPHSON: I am G. W. Josephson. I am with the Bureau of Mines and I am speaking for the Interior Department.

There has been a little change of spokesman for the Fish and Wildlife Service, but I think we can handle this as we go along.

For the sake of brevity, at this stage of the conference, we can take advantage of the fact that many of the technical and economic aspects have been discussed by previous speakers. A brief mention of these will suffice, and we can give primary attention to the outlining of some of the attitudes, views and activities of the Department of the Interior.

The water situation with which we are concerned today includes a large number of related problems which must be dealt with comprehensively in order to achieve coordinated progress and ultimate success. In the Interior Department virtually every agency has interests and concern for water either as a commodity or because of its utility in the field of responsibility of that agency. The interest of the Department of the Interior in water was expressed by Secretary Udall in a statement before a congressional committee this year as follows:

> "... the focus of Interior effort is directed to the maintenance of adequate national water supplies and adequate water quality for whatever uses man may wish to make of this valuable resource. The Interior approach emphasizes the coordination and interrelation between uses and the effect of these uses on management and quality of the total water supply system.
>
> "Maintenance of water quality involves not only the quality levels for human consumption, but also quality levels for consumption by other animal and plant life, for development of other natural resources, and for industrial processes. These quality considerations are interrelated. They can be understood and controlled best from the point of view of water as a resource, rather than from the point of view of a particular quality need."

In handling water problems over a period of years, the Department of the Interior has accumulated a great deal of experience. It has the facilities and qualified manpower to deal with a wide variety of water problems.

The Department of the Interior is particularly interested in the Monongahela River Basin because of its wealth of natural resources. The Basin is a major supplier of minerals and mineral fuels on which modern industrial life is dependent. Its forests, lands, and rivers provide other industrial raw materials, and serve the growing recreation needs of large urban populations.

I will not attempt to describe in detail the activities and programs of the Interior agencies, but I do wish to make it clear that in the Monongahela River area the Geological Survey, the National Park Service, the Bureau of Mines, the Bureau of Sport Fisheries and Wildlife, the Bureau of Outdoor Recreation, and the Bureau of Commercial Fisheries all have direct interests. Representatives of several of these bureaus are attending this conference and individual statements are being presented by spokesmen for the Geological Survey and the Bureau of Sport Fisheries and Wildlife.

Interior Department agencies carry on water quality studies and research related to the physical and chemical and, in some degree, biological adequacy of natural and developed water supplies. These studies and research are chiefly those in which the primary skills and required knowledge are based on geology, chemistry, hydrology, engineering and other physical science aspects of water management problems. Interior's water quality research extends moreover to the study of environments adequate for the propagation, production, and control of both fish and wildlife resources, and for water-based recreation. Water quality research in the area of fish and wildlife and recreation resources includes the effects of pollutants. Other Interior pollution research is associated with the effect of water quality in the processes of developing minerals and other natural resources, and with understanding the nature of water effluents from such uses.

In common with other agencies of the Executive Branch, the Department of the Interior has interests and responsibilities for the economic and social aspects of water quality management. Interior recognizes that such factors as quantitative requirements, competitive uses, and marketability of water and associated products must be given consideration in plans for water quality management including pollution control and abatement, particularly in planning, constructing, and operating multiple-purpose water development projects. Interior takes account of the economic impact and other values that protection of water quality and pollution abatement will have on the community, basin, State and nation.

In studying the Monongahela and similar rivers we find a variety of conditions. Minerals have been produced and processed in this basin for many years. As mineral industry activities and products play vital roles in our economy, it is obvious that this nation must continue to meet its growing mineral demands. Output of these mineral products requires process water and often generates waste effluents that degrade the quality of the stream.

Stream pollution from process wastes and from coal mine drainage now is generally recognized to be a serious problem. Enlightened management in the mineral industries recognizes the need for meeting responsibilities to the public. Within limits of available technology and economics, and where a demonstrable need exists, it adopts controls on its water-waste discharges, often in advance of any outside pressure. However, industry understandably does not welcome controls for which technology affords no economically practical means for compliance. To illustrate the economic and technical difficulties often faced, let us take an hypothetical example. Let us assume that conditions in one mineral producing area necessitate very costly pollution abatement measures. The rise in production costs from these measures may lead to closure of mineral industry operations, with disastrous effects on the local economy. In this case pollution from the abandoned operations might be even greater than before abandonment.

From laboratory research and field studies a number of methods have been developed for control of acid mine drainage. These measures generally fall into the following categories:

(1) Minimizing the contact between water and acid-producing materials;

(2) Regulating the flow of waste water to the streams;

(3) Regulating the flow of receiving streams;

(4) Neutralizing acid water; and

(5) Protecting the acid-producing materials from weather and erosion at the end of the mining operations.

Federal, State and private organizations have contributed to the progress that has been made.

But the means at hand have not yet solved the problem as a whole. Not only do many active mines and mineral processing operations contribute to water pollution, but effluents from abandoned mines and refuse piles also add to the problem. While we could not have done without the mineral wealth produced in the past by such operations, we do not relish their present polluting effects.

Acid mine water is a problem, but it is only one of many contributors to stream pollution. Much remains to be done on all aspects of our water supplies. In the past the Department of the Interior has cooperated with other organizations in water studies. Research, evaluation of present control methods, and demonstration projects are all needed. The Department is accelerating its water programs and is confident that technically and economically feasible solutions can be found for most of the questions that are presently unanswered. It welcomes opportunities to assist or cooperate with other organizations that have similar objectives.

In the statement of these objectives yesterday, Mr. Whetstone provided additional details on the activity of the Geological Survey. With your permission, Mr. Chairman, I will ask Mr. Gerald Taylor to conclude the presentation of the statement for the Bureau of Sport Fisheries and Wildlife.

MR. STEIN: Yes, if Mr. Taylor would come up.

STATEMENT OF GERALD G. TAYLOR, FISHERY BIOLOGIST, BUREAU OF SPORT FISHERIES AND WILDLIFE, DEPARTMENT OF THE INTERIOR, PITTSBURGH, PENNSYLVANIA

MR. TAYLOR: Mr. Chairman, distinguished guests:

My name is Gerald G. Taylor. I am a Fishery Biologist on the River Basin Studies of the Bureau of Sport Fisheries and Wildlife in Pittsburgh.

As Mr. Roberts was unable to attend here today, I have been selected to present this statement.

It was with more than usual enthusiasm that the Bureau of Sport Fisheries and Wildlife accepted the invitation to present a statement at this particular meeting concerning pollution in the Monongahela River Basin. I say greater than usual enthusiasm at this time because numerous such meetings have been held throughout many years at which the problems of water pollution have been largely recognized, but with much less hope in prospect for solution. Now, however, for the first time, opportunities appear ripe for action, rather than mere resolutions, for an effective attack on water pollution on all fronts -- including mine acid.

This promising situation which is our good fortune to enjoy today has been brought about as the result of public recognition of the vital necessity for multiple-use of water resources, and public determination that pollution can no longer be tolerated if communities are to survive and prosper. No longer can communities afford to permit their water resources to be exploited by a single industry to the exclusion or restriction of their use for other purposes. The lesson here illustrated in the Monongahela River Basin is a classic example of such a history. In this instance, pollution resulting from coal mining has curtailed the usability of streams throughout most of the Monongahela Basin. The highly acid waters emanating from coal mines have so contaminated streams that their use has been restricted for industrial and domestic purposes. As a result, treatment costs for industrial and domestic uses of Monongahela waters have been steadily increasing and vital water-based recreational opportunities have suffered extreme depletion.

The economic stability and development of a community depend to a large degree on the quality as well as quantity of its water supplies. Pollution is a significant obstacle to the economic recovery of the depressed condition prevailing in the Monongahela Basin.

The Bureau of Sport Fisheries and Wildlife is interested in all aspects of fish and wildlife conservation and development in the Basin. Under Section 5 of the Fish and Wildlife Coordination Act we are authorized to study the effects of pollution on fish and wildlife and to recommend methods to alleviate the undesirable effects of this pollution. Under Section 2 of this same Act we have a particular responsibility in connection with water resource development projects in the Basin, whether planned and constructed by Federal agencies or under Federal license. That responsibility is to ensure that consideration be given both to protection and enhancement of fish and wildlife resources in planning, construction, and operation of such projects. In carrying out this responsibility, we work closely with all Federal, State, and local agencies in order that all facets of public interest in water resources may be properly considered.

The conservation and improvement of fish and wildlife resources are closely linked with water quality -- a factor which is also of vital concern to us in the operation of a National Fish Hatchery in the Basin near Bowden, West Virginia. This hatchery, constructed at a cost in excess of $600,000, annually provides 315,000 brook, brown, and rainbow trout (weighing a total of 90,000 pounds) for fishery management programs in Maryland, Pennsylvania, and West Virginia.

Pollution within the Monongahela River Basin is an interstate problem involving the States of West Virginia, Pennsylvania, and Maryland.

Many types of pollutants enter the drainage, but as might be expected, the severity of domestic and industrial contaminants (other than from coal mining) are generally confined to the mainstem of the Monongahela River and its larger tributaries. Acid pollution resulting from coal mining is widespread throughout the watershed and is by far the most severe contaminant affecting fish and wildlife resources. This being the case, I will confine the remainder of my statement to this problem.

The mainstem of the Monongahela River is excessively polluted and devoid of significant fish life throughout its entire length.

The Youghiogheny River is the largest tributary of the Monongahela River Basin in Pennsylvania. Mine acid pollution in this drainage is locally severe in a few of its tributaries, but the mainstem is in fair condition except in its lower reaches. Most of the acid in this watershed originates in the headwaters of Casselman River, its principal tributary. With but few exceptions, the small tributaries to the mainstem of the Monongahela River in Pennsylvania are polluted with mine acid and support no fisheries.

Within the West Virginia portion of the Monongahela Basin, the three principal tributary drainages -- Cheat River, Tygart River, and West Fork River -- are contaminated with mine acid in upper portions of their watersheds. As a result, the lower sections of these rivers support no significant fishery resources.

The Cheat River subbasin is the least polluted of the three subbasins in West Virginia. This stream provides excellent warm-water fishing throughout a 38-mile reach downstream from its origin near Parsons, West Virginia. Contamination of the stream with mine acid precludes significant fisheries throughout the remaining 40 miles to its mouth. Upstream from the community of Parsons, Shavers Fork and Dry Fork (the major tributaries of Cheat River) are generally excellent fishing streams. A small amount of strip mining activity is occurring in the watershed of Shavers Fork. This is particularly alarming, since this mining activity could jeopardize water supplies at the Bowden National Fish Hatchery unless potential mine acid from these workings is rigidly controlled. Pollution from mine acid exists throughout the upper watershed of Blackwater River -- a large tributary of Dry Fork. This area is honeycombed with abandoned deep mine shafts which contribute appreciable quantities of acid. In addition, a recent increase in strip mining activity in this area has increased acid contamination of streams in some localized areas. Although Blackwater River drainage contributes considerable quantities of mine acid, these waters are generally neutralized upon mixing with the alkaline waters of Dry Fork.

Tygart River is polluted with mine acid and supports insignificant fishing throughout most of its length. Mine acid pollution is also extensive in its largest tributary -- Buckhannon River. Tygart Reservoir, located just upstream from Grafton, West Virginia, is also acid and provides no significant fishery.

West Fork River is polluted with mine acid downstream from Clarksburg, West Virginia, and supports no significant fishery throughout this 40-mile section. Both abandoned and active deep mines are numerous in this area and are the principal sources of this pollution. Strip mining is also widespread within this lower section of West Fork Watershed. Upstream from Clarksburg, a small amount of strip mining occurs, but pollution from these sources is minor, and moderate fishing exists throughout the upper 60 miles of the stream.

The foregoing presents a grim picture of the extensive pollution of streams within the Monongahela River Basin resulting from mine acid. The highly industrialized basin contains an estimated 1,380,000 people, and the needs for fishing opportunities are high. Fishing waters, however, are in critically short supply in this area.

It is trite to say that all of us here recognize that the polluted condition of streams within the Monongahela Basin is critical, and that application of adequate measures are needed here and now to remedy the situation. It is recognized, however, that there probably is a considerable variance in views as to just what would constitute adequate measures to accomplish the degree of pollution abatement desired.

From the fish and wildlife standpoint we must emphasize that fish and wildlife resources are limited by extremes rather than average conditions -- that unless water quality is maintained well within maximum toleration limits at all times, fish and wildlife will not flourish. Since acid pollution is a prime consideration here, it is important to point out that the degree of acidity as expressed in pH determines the destructive potential of acid on organisms rather than the quantity of acid.

In other words, simple dilution of mine acid with water will reduce the concentration of the total acid, but may not result in a corresponding improvement in the pH.

Numerous other considerations must be taken into account in establishing water quality criteria for fish and wildlife. The complex of factors involved in predicting improvement from such measures as dilution preclude optimistic predictions at this time, although dilution may have some merit. We urge that primary emphasis be placed on control of mine acid formation and discharge at its source in order to bring about pollution abatement in the Monongahela Basin.

We would like to affirm again our interest in cleaning up the waters of the Monongahela Basin and our willingness to assist in development of a plan of action which will make it possible to reestablish fish and wildlife resources which can bring great economic as well as recreational benefits to the people of the area.

Thank you.

MR. STEIN: Thank you, Mr. Taylor.

Are there any questions or comments?

MR. YOST: One question, Mr. Taylor.

MR. TAYLOR: Yes, sir.

MR. YOST: You indicated that your investigations show that certain streams and tributaries were honeycombed with abandoned inactive mines, and that there were numerous mines along these tributaries in the mainstem of the Monongahela River.

Did you come up with any quantitative count of the number of these openings?

MR. TAYLOR: No. We didn't go into detail. The statement that I made was that the watershed of the Blackwater River, the upper watershed area, was honeycombed, but most of it has been worked out, I understand. However, the strip mining activity is contributing to a possible problem here by opening some of the abandoned shafts, and it has to be watched, or it should be watched very closely.

MR. YOST: My primary interest in this area was, I wondered if your service or bureau had plotted the locations of these abandoned mines.

MR. TAYLOR: No, we haven't gone into that detail. The State of West Virginia probably has most of the information available in basic data form.

MR. YOST: What kind of form?

MR. TAYLOR: Probably in a basic data type of form for different areas.

MR. YOST: Well, I am from West Virginia. My point is that if you have any information as to the location and number of these mines, we would be very happy to look at it.

MR. TAYLOR: No. I only have gross figures.

MR. YOST: All right.

MR. STEIN: Are there any further comments or questions?

(No response.)

MR. STEIN: If not, thank you very much, Mr. Taylor.

This concludes the Federal agencies' statements, and at this point we will call on Dr. Wilbar.

DR. WILBAR: Mr. Chairman, as the conferees at least knew at the beginning of this conference, I am going to have to leave a little before twelve and catch the plane to Philadelphia, where I am giving a talk.

Mr. Karl Mason, the Director of the Bureau of Environmental Health of the Pennsylvania Department of Health, will sit in as the Pennsylvania conferee in my stead.

Before I go, there are two representatives of organizations of Allegheny County who have asked to speak before this conference, and I would like to introduce them one at a time.

First, Mr. William D. Henning, an attorney at law, who is representing the Allegheny County Sportsmen's League.

STATEMENT OF WILLIAM D. HENNING, ESQ., ALLEGHENY COUNTY SPORTSMEN'S LEAGUE

MR. HENNING: Mr. Chairman, members of the conference, ladies and gentlemen:

My name is William D. Henning. I am an attorney from the City of Pittsburgh, and I am here representing the Allegheny County Sportsmen's League.

First I want to express the appreciation of the Allegheny County Sportsmen's League in being given this opportunity to present its views to such a distinguished group.

The League is a nonprofit corporation, chartered by the Commonwealth of Pennsylvania through its courts for the express purpose of conserving the natural resources of our State and nation -- our soil, our waters, forests, minerals and wildlife. We know of the interrelationship between our renewal natural resources, but in the past most of our conservation activity has related to the waters of our Commonwealth. It seems that we have had an unending battle to protect our clean streams and to clean up our dirty rivers.

We have fought court battles; we have filed complaints with our Sanitary Water Board; we have exposed polluters; we have testified before our Legislature and before the Congress; we have supported legislation designed to protect our watersheds and we have even supported political office seekers on a nonpartisan basis when such is necessary for good conservation.

It is the League's considered opinion that too little progress has been effected by State and interstate agencies; that their glowing reports of progress are self-serving and misleading; and that all too often the pollution of our waters has not been abated. In the 26 years since the Pennsylvania Pure Stream Law was first enacted, much has been accomplished, but still more remains to be done. We are still losing streams to pollution at an alarming rate in Pennsylvania.

We are of the opinion that the Federal Government should literally force the abatement of water pollution. In support of this opinion we submit the following:

1. Virtually all of our waters are interstate in nature, for the raindrop falling in Salamanca, New York, Morgantown, West Virginia, in parts of Maryland and certainly here in Pittsburgh will certainly affect the industries, the municipalities and the people all the way to the Gulf of Mexico. We believe that in the future every effort should

be made to insure that such industries, municipalities and people will not be adversely affected by the poor quality of water that we are flushing at them.

2. We believe that the competitive position of our great industries precludes the enforcement of a pollution abatement provision in our State while a competitive plant in a neighboring State is not similarly restricted. The fact that we have to accept pollution from another State, without having effective recourse, is unjust and frustrates the intentions of the laws of the State of Pennsylvania.

3. Too often, powerful lobbies prevent the passage of adequate legislation in various States and similarly preclude the enforcement of laws in States having adequate regulations. At present, who you are -- or whom you know -- is sometimes more important than what you are actually doing to clean up your effluent.

4. Many State agencies are understaffed and are unable to properly enforce the law. This is not necessarily the fault of the agency, but is often due to the fact that insufficient funds were appropriated. In the Pittsburgh Press on Sunday, December 15, 1963, appeared an article concerning a lake belonging to the Allegheny Boy Scout Council. Our Sanitary Water Board is reputed to have stated that it couldn't afford to spend the $1,000

necessary to trace the source of the acid which has destroyed that lake for the purposes for which it was intended.

5. In Pennsylvania, acid mine waste receives special attention under the Pure Stream Act, in that the Sanitary Water Board cannot order the abatement of such wastes until it is determined by the Board that treatment of such wastes is economically feasible. To date our Board has made no such determination and as the result thereof, acid mine waste from deep mines continues unchecked.

Yesterday, ORSANCO representatives indicated that chemical neutralization of acid mine waste was recommended by ORSANCO in certain cases. Conservationists have been saying the same things for years. We would qualify such recommendation as follows: Chemical neutralization of acid mine waste should be mandatory in all cases of stream pollution, involving active working mines.

This brings us to the function of ORSANCO and its relationship to its member States. Basically, ORSANCO cannot enforce any of its orders against polluters. The compact requires that the individual States shall first abate the pollution within their borders -- then, if the States fail to act, ORSANCO may order a clean-up. Even here, we must understand the basic limitation set up in the compact -- before ORSANCO orders may be enforced, two of the three members of the delegation from the State in which the pollution occurs must concur in the court action enforcing such orders.

I am reminded that virtually every parent wants first to decide and then administer the punishment to his own child.

Generally, conservation groups have had no real quarrel with ORSANCO, although we have sputtered a bit when our friend, Mr. Cleary, has talked about standards and the dedication of streams for particular purposes -- including the transmission of wastes. We have wondered if such dedication will forever designate a stream as a polluted waste carrier.

But interstate agencies such as ORSANCO just don't have the power to enforce pollution abatement within the individual States. At best, ORSANCO has been a coordinating agency, reflecting the collective views of the various water boards or health departments of its member States. It cannot enforce but can only recommend. Under the provisions of the compact, practical enforcement of the recommendations is reserved to the individual State wherein the pollution occurs. While we must admit that ORSANCO has exerted some good influences on the compact States, and we do not want to sound critical, we must maintain that Federal controls will be more just, more uniform and more effective.

Finally, the League, along with every other recognized conservation organization, has continually asked for stronger Federal legislation, providing for the abatement of all water pollution by domestic or industrial waste with appropriate criminal penalties so that violators can be punished. We are certain that the millions of sportsmen and conservationists in the States represented here today will provide the support for the passage of such a law.

Thank you.

MR. STEIN: Thank you very much.

(Applause.)

MR. STEIN: Are there any comments or questions?

(No response.)

DR. WILBAR: Thank you, Mr. Henning.

The other representative of an Allegheny County organization is Mr. Francis X. McCulloch, Attorney at Law, representing the Allegheny County Boroughs Association.

MR. STEIN: Before you begin, I think the record at this point will indicate that Mr. Karl Mason is coming up to sit as conferee for Pennsylvania.

STATEMENT OF FRANCIS X. MC CULLOCH, ESQ.,
ALLEGHENY COUNTY BOROUGHS ASSOCIATION

MR. MC CULLOCH: Gentlemen of the United States Department of Health, Education, and Welfare, distinguished guests:

My name is Francis X. McCulloch. I am an attorney and I represent the Allegheny County Boroughs Association, which is also a member of the Allegheny County Seminar.

Allegheny County has spent over $300 million in the construction of disposal plants for the treatment of sewage, including the City of Pittsburgh. We are paying, at the present time, hundreds of thousands of dollars a year, notwithstanding the fact that the rivers are still temporarily polluted.

The only thing I want to bring to the attention of this group is this fact: This is in the light of the enactment of legislation in 1923, when they originally initiated and tried to clean up these streams of Pennsylvania then the Act of 1937, when they established the Sanitary Water Board, but never gave it the financial assistance to be able to enforce or make an attempt to clean up these streams, with the Sanitary Water Board, which has never had the financial assistance or manpower to be able to clean the streams up; then comes along the Act of 1945, which says it is economically unfeasible to treat mine acid.

Until such time as research determines that, mine acid in the Commonwealth of Pennsylvania will not be treated.

I would say that under those circumstances, the coal industry, which in many instances is a sick industry, but a necessary industry, which in all probability will be going out of date in the next twenty years through atomic energy and leave this devastated area of mines and strip mines would have visited upon us a travesty on justice. I think if the proper coordination would be made working with the United States Department of Health, Education, and Welfare, and ORSANCO, and the States themselves -- West Virginia, Maryland, Pennsylvania and its associated State, Ohio -- you would begin to get a job done, and you could work together and find out what could be done.

In the light of the geographical survey made here, it is economically feasible to treat mine acid, and I think it is a travesty on justice that any particular few have the right to assume the complete control and are given natural rivers, to the exclusion of the great preponderance of the people.

It has been a pleasure to have this opportunity to talk to you and explain the situation as far as Allegheny County is concerned, that it is a travesty on justice that the rivers are not being cleaned.

Even in the Allegheny, nothing has been done and some of the mines are dumping into the Allegheny River in full force at the present time.

It has been a pleasure.

MR. STEIN: Thank you, Mr. McCulloch.

Are there any comments?

MR. YOST: Mr. McCulloch, I didn't quite understand your comment there in the latter part of your statement about one single agency doing something. Would you clarify that?

MR. MC CULLOCH: I stated under the Act of 1945, which is still the law in Pennsylvania, it states that until such a time as it is economically feasible to treat mine acid and research can show that, that there is no authority in the Pennsylvania Sanitary Water Board to take any action, and they are allowing those conditions to exist today.

In fact, up in the area where I live in the Allegheny Valley, the Harmon Coal Company, which is a subsidiary of Wheeling Steel, is pouring full force. All the acids are pouring into the river. Yet, we have a sewage treatment plant right at the mouth of that river at Deer Creek, cleaning up the acids, for which we are paying $6 and $7 a month, each individual person.

Now, that hasn't been done at all. No effort has been made to clean that up or straighten that particular situation out.

What is the purpose of us spending all this money and getting nothing to accomplish the treatment of sewage waste or pollution in the river?

In the light of the geographical survey, the survey made by the National Geographic Association, if they have the means of economically treating mine acids, why shouldn't it be done? Why shouldn't it be done by the United States Department of Health, Education, and Welfare?

It is never going to be done by the Pennsylvania Sanitary Water Board, if you will live a hundred years, and it won't be done unless the United States Department of Health, Education, and Welfare takes charge.

Thank you very much.

(Applause.)

MR. STEIN: Thank you.

Are there any comments or questions?

Mr. Mason, do you have one?

MR. MASON: I think I would like to comment, if I could, on both Mr. Henning's and Mr. McCulloch's statements.

I think the record indicates here that we, as far as Pennsylvania is concerned, and I believe everyone else, recognize the enormity of the problem of treating acid mine drainage. There has been a great deal accomplished in Pennsylvania on the prevention of additional mine drainage since 1945.

But we do recognize that the drainage originating from mines primarily abandoned that preceded the 1945 Act is a very major problem, and we believe that it is going to take the concerted efforts of all levels of government and industry and private citizens for a very comprehensive and expensive program. We believe we should get on with the job, all Federal, interstate and State agencies together.

(Applause.)

MR. STEIN: Thank you very much.

I want to say to you, and to Mr. Henning, as a public official, sometimes views such as yours are representative of the kind of people that you can't live with, but there is another aspect to the coin. I say, by the same token, as a public official, we can't live without you either.

There are always these various sides to the pollution problem. I think, Mr. McCulloch, you brought up a very interesting point at the end, and I think this is one to keep in mind.

If you are going to clean up a stream for its uses, you can't clean up one aspect of it and have major pollution still flowing in and expect to use that stream. Unless you restore that stream to uses to which it hasn't been put before, the people are not going to see a clean-up, and I don't know that you have done the job.

At this point, I think that we will call on Mr. Shaw.

MR. SHAW: Mr. Chairman, I would like to introduce Dr. Meredith Thompson from the New York State Department of Health, who will have a statement to make as a representative of the State of New York.

Dr. Thompson.

STATEMENT OF DR. MEREDITH THOMPSON, ASSISTANT COMMISSIONER FOR ENVIRONMENTAL SERVICES, NEW YORK STATE DEPARTMENT OF HEALTH

DR. THOMPSON: I am Meredith Thompson, Assistant Commissioner for Environmental Services of the New York State Health Department, and am representing Dr. Hollis Ingram, the Commissioner of Health of the New York State Health Department, who is a Commissioner of the Ohio River Sanitation Commission. I am making the presentation of a statement for the Water Resources Commission of New York State, which is the policy rule-making body of all water resources problems of New York State, of which Dr. Wilm is the Chairman.

After the statement I would like to make a few additional statements.

This is a resolution supporting the Ohio River Sanitation Commission in interstate pollution control activities and calling for Federal partnership instead of unilateral intervention.

"WHEREAS, The Secretary of the Department of Health, Education and Welfare of the United

"States has, under the Federal Water Pollution Control Act, called a conference to be held December 17-18, 1963 at Pittsburgh, Pennsylvania, in the matter of pollution of the interstate waters of the Monongahela River situated within the Ohio River Valley Water Sanitation Compact District; and,

"WHEREAS, The Congress of the United States has traditionally declared its policy to recognize the responsibilities and rights of the State in water resources administration; and has traditionally encouraged the development of interstate agencies to administer programs designed to meet the problems of an interstate nature in all fields including water pollution; and,

"WHEREAS, New York joined the seven other signatory states in creating the Ohio River Valley Water Sanitation Compact Commission for the purpose of effecting orderly abatement and control of the pollution of the waters of the Compact District; and,

"WHEREAS, That Commission (ORSANCO) in cooperation with the signatory states has made real progress in abating pollution of the entire

"District including the Monongahela River Basin; and,

"WHEREAS, Unilateral Federal intervention in water pollution control would not be conducive to the promotion of state and interstate action; and,

"WHEREAS, New York State believes strongly in the interstate compact concept for the resolution of problems spanning state borders with assistance from the federal government only when clearly needed;

"NOW THEREFORE BE IT RESOLVED THAT, No Federal enforcement action should be undertaken until or unless joint state or interstate Federal studies and surveys indicate that such actions are essential to reenforce state and interstate actions; and

"BE IT FURTHER RESOLVED THAT, The New York State Water Resources Commission recommends that the Secretary of Health, Education and Welfare through his representative on the Ohio River Valley Water Sanitation Commission implement the Federal intent as expressed in the Federal Water Pollution Control Act to cooperate with and assist the states to carry out effective water pollution control "programs; and,

"BE IT FURTHER RESOLVED THAT, The Chairman of the Water Resources Commission forward copies of this resolution to the Ohio River Valley Water Sanitation Commission and the Secretary of Health, Education and Welfare.

ADOPTED, December 5, 1963
Albany, New York
/s/ H. G. WILM, CHAIRMAN
NEW YORK STATE WATER RESOURCES COMMISSION"

We feel, and everybody agrees, that the Department of Health, Education, and Welfare has a definite responsibility in water pollution control. Everybody wants to see that this responsibility is carried out.

However, we do have some concern with how some of these aspects of water pollution control are carried out or may be carried out, and one of our major concerns is, with this type of conference -- for instance, we do not believe that this type of conference is the first step that the Department of Health, Education, and Welfare should take in determining what an existing problem may be in the field of water pollution control. We feel, No. 1, that it is an unnecessary expenditure of tax funds.

No. 2, it certainly confuses the communities and industries as to whom do they look for guidance and responsibility in the field of water pollution control; and,

No. 3, it can be done without any fanfare, by meeting with the individual States, and via the Ohio River Sanitation Commission, who has the responsibility in this particular item.

Also, I think it has been pointed out here that what you want to determine first are the facts behind the problem. As was demonstrated by Dr. Wilbar, the kind of facts that are brought out here should be straightened out first by the technical people, to make sure that they are correct, and that we agree with them. Then, from that point on, we determine what the problem is and how to resolve it.

ORSANCO certainly has a demonstrated progressive program in water pollution control. The degree anybody can argue with. It depends how far you want to go, how fast, with how much money.

The United States Public Health Service is a full member of ORSANCO and, therefore, makes it a body that can resolve the problem with all the responsibilities, including enforcement action, at that level.

ORSANCO also has the responsibility to see that the States carry out their responsibilities in water pollution control, and also has Congressional responsibility, because it is a compact approved by Congress, and therefore they have a complete legal responsibility to carry out this job, and it should be seen that they do carry it out.

Now, we have these facilities and responsibilities and the question is to whom does the community and industry look to give them guidance? Is it the State? Is it an interstate agency? Is it a Federal agency? Or do we all work together so that the industries and the communities have at least one story as to what has to be done, and how, and where, and when, and how much it is going to cost them? It is not just as simple a problem as sometimes many of us would be led to believe.

Certainly, it is the intent of Congress that water pollution control activities followed by the Department of Health, Education, and Welfare should be in a coordinated and cooperative fashion with the State and with the interstate agencies, the interstate compacts. Otherwise it would not have formed them in the first place.

Now, the theme is if any Federal agency, in this case the Department of Health, Education, and Welfare, is not satisfied with a job, or if they are satisfied with a job, they could certainly keep their fingers on the water pollution control problems and programs in each State in each Federal agency, so that we can determine at any one time, are we in agreement or disagreement with the programs that are being carried out.

But we have to determine at some level what our objectives are, and, as you folks well know, objectives can vary from people to people and from agency to agency; but this has to be determined sitting down around a table and not at a public conference, to determine actually where we are going and how can we get there most economically and most efficiently.

This includes not only determining the progress that any community or any State or any interstate agency is making. It also determines, as was pointed out here, are controls available to prevent pollution which may be existing or additional treatment that is available to treat the kind of waste that you are talking about.

The other item that we certainly get into, and which we somehow or other skirt around, is the economics of the problem. I don't mean only the economics of providing adequate waste treatment and sewage treatment, but I am talking about the economics to the communities or to industry, to whomever it may concern, and this involves not only how much does it cost you for sewage treatment, as was pointed out here this morning in reference to sewage treatment for Pittsburgh and the greater Allegheny area, but also communities seem to have other problems. At least, the community I live in has other problems. They have to provide money for a safe water supply.

Now, let's assume that you have a community that you are going to put the bite on to spend several million dollars for sewage treatment. Somebody is also putting the bite on to them that they have a real health problem, that their water supply is not safe, that it is not adequate, and somebody has to put out another few million dollars for a water treatment plant.

Also, I am sure we are all familiar with the needs of education. Somebody has to pay for the new school, whether a high school, grade school, college or what not.

The communities have to decide this. They have to decide whether they need it, how they are going to finance a refuse disposal problem, how they are going to finance their housing problems. Somehow or another, these all add up to dollars, and the dollar sign isn't only on sewage treatment, so the problem is who determines what the community is going to spend its money for.

Does the Federal Government come in and say, "Well we don't care whether you have a water problem. You are going to have to spend your money for sewage treatment or some other facility"?

This is why this problem eventually resolves itself down to you, the individual citizens, in a community and in the individual State, as to how the problems are going to be resolved. They may be interstate problems, but you will also have the intrastate problems which are along the same level. When we have a public hearing like this, it may take the priority from a community, which has a real problem, and throw it where you are going to make them spend the money on a sewage treatment problem. I don't think this is the kind of thing that can be done.

I think the other item that we have to keep in mind is that even though you do provide sewage treatment, it is not a problem that you resolve once and for all. The economics come into the problem again, in that if you put a sewage treatment plant into Pittsburgh today, as soon as you have another person move into it, the pollutional load of the stream increases. As the population increases, regardless of what treatment you provide, the pollutional load is going to increase. If you want the stream for fish and you have to maintain it at the maximum level, then at some time the pollutional load in that stream is going to arrive at that point again.

Somebody has to determine, "Okay, we are going back to the three communities on this stream and tell them now that they have to spend another $10 million, the industry has to spend another $5 million, so that we can keep this stream for fishing or bathing, or whatever you want to use it for."

These are problems that have to be determined on the total problem of economics, and are not just the one picture that we sometimes look at, in this case water pollution.

I think everybody is agreed that somebody, some way, somewhere, has to do something about the total water pollution problem, but let's not lose the picture of it in the total context of the needs of communities and the pollutional loads.

I think this whole job can be done more effectively and more efficiently if, as I pointed out, we work together with the Department of Health, Education, and Welfare, and ORSANCO, and the States, and sit around the table and determine what our objectives are, and where we are going.

Thank you.

(Applause.)

MR. STEIN: Thank you, Dr. Thompson.

Are there any comments or questions?

(No response.)

MR. STEIN: I have just one for clarification.

As I understood you to say several times, problems like this should be resolved not in a public conference, but by sitting around the table.

DR. THOMPSON: That's right.

MR. STEIN: Now, is it your suggestion that this could be better handled if we just sat down with ORSANCO and representatives of the States, without the press or the public being in on it?

DR. THOMPSON: I would say so, and the reason I say this, as was brought out this morning here by Dr. Wilber, is that there was some discrepancy or some discussion about are the technical facts we are presenting here to these people right.

This is the kind of thing I mean. Let's sit down and determine what the facts are, and then determine, okay, this is the progress we have made so far with the facts at hand. What are you going to do about it?

MR. STEIN: You don't think the public character of this may overweigh minor discrepancies such as we have had?

DR. THOMPSON: I don't think it is going to overweigh the fact that eventually the community is going to have to spend so much money on so many things. I don't think water pollution is the only problem.

MR. STEIN: We are certainly glad to have your views, sir.

Are there any other comments or questions?

(No response.)

MR. STEIN: If not, I think the record here should show that the two conferees from Maryland, Mr. Paul McKee and Mr. Robert Brown, both are not here today. They have, however, requested and supplied us with a statement and recommendation of the conferees from Maryland. They said:

> "It is requested that this additional material be included with the statements of the Maryland conferees as part of the official conference record."

MR. YOST: Do you intend to read that now?

MR. STEIN: Yes, I do.

MR. YOST: Don't you think that is a little premature? We haven't had a chance to get together and decide or come up with a joint statement.

I think that perhaps that would be better delivered after we have had the joint meeting of the conferees to determine what the --

MR. STEIN: If the conferees want to do that, I might point out that as far as I know the only statements that anyone has had the benefit of in advance were the HEW statements, which were distributed. We didn't have any previous knowledge of any of the statements of the State, interstate agencies, or the other participants.

If you want to discuss this first before Maryland puts this in, this is a privilege, but I think if you wish, you may modify it. I have some suggestions on the modification.

However, Maryland has made the request that its statement be included in the record.

MR. YOST: I have no objection to its inclusion. I am only talking about when you present it. I think it ought to be presented when everybody presents his.

MR. STEIN: Do you wish to wait before this is included, conferees? Is this what the conferees want to do?

MR. YOST: I haven't talked to them.

MR. STEIN: Let's take a consensus. We will be happy to do that.

(Discussion off the record.)

MR. STEIN: May I have your attention?

In the interests of Federal, State and interstate comity, we will recess for fifteen minutes, and we will reappear then.

(Whereupon a recess was had.)

MR. STEIN: May we reconvene?

Off the record.

(Discussion off the record.)

MR. STEIN: First, I would like to read at this point the statement and the recommendations of the conferees from Maryland, and the Maryland conferees, Mr. Brown and Mr. McKee, in their statement said:

"(It is requested that this additional material be included with the statements of the Maryland Conferees as a part of the official conference record.)

"The Maryland Conferees have reviewed the 'Report on Pollution of the Interstate Waters of the Monongahela River System' prepared by the Pollution Evaluation Unit of the R. A. Taft Sanitary Engineering Center of the Public Health Service, December 1963. The Maryland Conferees concur in the conclusions and recommendations presented, for the Maryland portion of the Monongahela Basin.

"While the objectives of the Conference are directed toward planning for abatement of all forms of pollution which diminish the quality of the Monongahela River System, one form of pollution

(Whereupon a recess was had.)

MR. STEIN: May we reconvene?

Off the record.

(Discussion off the record.)

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"While the objectives of the Conference are directed toward planning for abatement of all forms of pollution which diminish the quality of the Monongahela River System, one form of pollution

"-- mine drainage -- deserves, in our judgment, a concerted action program which should be initiated without delay.

"To this end, the Maryland representatives urge that the Conferees participating in this Conference adopt the following recommendations as a result of these deliberations:

"That a comprehensive survey be organized to locate and quantitatively evaluate all sources of acid mine drainage in the Monongahela Basin;

"That an estimate of the cost of correcting all sources of acid mine drainage be made together with the cost required to maintain appropriate corrective measures to assure continuing control;

"That a demonstration project be organized to establish methods and procedures of proved effectiveness for mine sealing and prevention of acid mine discharges to streams;

"That the Public Health Service assume initiative for establishing a program, with collaboration of Federal, State and Interstate Agencies, for carrying out the necessary survey, cost estimation and demonstration programs; and in determining appropriate Federal responsibility in financing the required work.

"/s/ Paul W. McKee	/s/ Robert M. Brown
Director	Chief, Bureau of Environ-
Maryland Water Pollution	mental Hygiene, Maryland
Control Commission	State Dept. of Health"

This concludes Maryland's statement.

Closing Statement - Mr. Stein

The conferees, in discussing this, have agreed for the whole conference on the following:

Pollution of an interstate nature exists in the Monongahela Basin which adversely affects municipal and industrial water supplies, fish and wildlife, recreation, such as fishing, boating, swimming and navigation.

The States of West Virginia, Pennsylvania, Maryland and ORSANCO have made appreciable progress in water pollution abatement, and have presented acceptable programs for the control of industrial and municipal wastes.

Cognizance is taken of Pennsylvania's program to abate pollution from such sources by the end of 1966. Commensurate programs have been developed by West Virginia and Maryland. It is recognized that court action may necessarily modify this program, and that economically depressed communities in the basin may have to depend on outside financial assistance

The establishment of a technical committee, consisting of representatives of Maryland, West Virginia, Pennsylvania, ORSANCO, and the Federal Government, to explore the means of abating pollution caused by coal mine drainage is recommended. This committee would be charged with determining the amount of pollution from such mines. The committee also would be charged with developing a remedial program, including a cost estimate.

Are there any comments by the conferees?

(No response.)

MR. STEIN: Then I would like to thank you all for coming.

I think we have made considerable progress in arriving at broad areas of agreement between the States, the interstate agencies, and the Federal Government.

We want to thank you all for coming, and we recognize, as you have seen here, that while there may be differences in basic philosophy and, yes, even in the appropriateness of the Federal law itself, under our democratic system we do have the kind of system in this country where we can meet together and come up with what I hope will be an effective program.

Speaking for myself, it seems to me that the State and interstate agencies have demonstrated assiduous diligence in evaluating and dealing with this problem. I do think that the conclusion of the conferees will form a basis by all parties concerned to see that the Monongahela River Basin is restored to the maximum amount of uses for all its dwellers, and the quality of the waters in the Basin will meet these purposes.

Thank you very much for coming.

MR. THAYER: Mr. Chairman, I have a letter here from the Assistant Secretary of Health. He told me I would be allowed to present my evidence at this meeting.

How come I am not, after continuously asking here? Why have you denied me the right to the floor?

MR. STEIN: Would you come up?

MR. THAYER: Yes, sir.

MR. STEIN: How long will this take?

MR. THAYER: A very little bit of time. My name is Everett Thayer.

MR. STEIN: Let me see the letter.

(Mr. Thayer handed the letter to Mr. Stein.)

MR. STEIN: Let me explain the law to you.

MR. THAYER: I have the right there, sir. Can I

MR. STEIN: Wait a moment.

MR. THAYER: All right.

MR. STEIN: There are a lot of other people here too.

Under the law, this is a conference between the Federal Government and the State and interstate agencies. Under the law, we are charged only with inviting other Federal agencies who are part of the Federal establishment, and the State and interstate agencies. This we have done.

Under the law again, all other participants must be invited by the State or interstate agencies.

Are you from Pennsylvania?

MR. THAYER: I am from Pennsylvania -- Pittsburgh.

MR. MASON: Mr. Thayer, Dr. Wilbar spoke to me about your request and stated that on the part of the Secretary of Health and the Sanitary Water Board, in the interests of time for this conference, he was ruling that only representatives of organizations would be permitted to testify. As you will note, the two individuals whom we had today were representing organizations, and, as far as we understand it, you are speaking as an individual. Thus, you would not come within that part of the rule.

MR. THAYER: How many does it take to make a committee? Any interested people? How many does it take to make a committee? Anyone who wants to come in here?

MR. STEIN: How long do you think your presentation will take?

MR. THAYER: Maybe ten minutes.

MR. STEIN: Why don't you go right ahead?

MR. THAYER: Thank you, sir.

STATEMENT OF EVERETT THAYER, CITIZEN

MR. THAYER: Mr. Chairman, conferees, ladies and gentlemen:

I am a voting citizen. I also have a committee --

MR. STEIN: Would you identify yourself for the record?

MR. THAYER: Would you get the letter out and read it to them, that you received yesterday?

MR. STEIN: Why don't you identify yourself by name?

MR. THAYER: Everett Thayer.

A mighty important point in this, a very important point -- I will identify myself as this from years back -- International Organization of Masters, Mates and Pilots, Local No. 28, 721 Cotton Belt Building, St. Louis 2, Missouri

"INTERNATIONAL ORGANIZATION
OF
MASTERS, MATES AND PILOTS, LOCAL NO. 28
Affiliated with American Federation of Labor also
Railway Labor Executives Association
721 Cotton Belt Building

"St. Louis 2, Mo.
CE. 1-2589 -- CE. 1-2590

December 13, 1963

"Department of Health, Education & Welfare
Ball Room Hilton Hotel
Pittsburgh 22, Pa.

Attention: Mr. Frangos

Dear Sir:

"I wish you a very successful two day meeting in Pittsburgh, Pa. on 17 and 18 December. It is very gratifying to know that the U. S. Government, Department of Health is interested in overcoming a very difficult and hard task of getting rid of refuse leading to beautifying the waterways in the Pittsburgh area. There is no question that these unwarranted conditions on the rivers has come about as a result of unnecessary dumping with a total disregard of the general health and welfare of our citizens. I am certain that with the establishment of a hard working law enforcing group the scenic beauty can again be restored.

"Attending your two day meeting as one of "your guests will be Mr. Everett Thayer, a successful local businessman and a person who has continually dedicated much of his free time for betterment and cleansing of our rivers. I am certain that should Mr. Thayer be requested he will assist your Department to the fullest in carrying out any successful campaign. I first became acquainted with Mr. Thayer while serving as a Coast Guard Officer in Pittsburgh prior to my retirement. He is a man of great character and is proud of his community with an unceasing devotion to correct a very deplorable condition. I am certain that if called upon, he has available much valuable information which will greatly reduce the research necessary under your guidance and leadership.

"Sincerely
Norman W. Bouchard
U.S.C.G., RET.
Secretary of Local No. 25, Pitts.
Trustee of local No. 28, St. Louis

NWB:bb

cc: Mr. Everett Thayer"

Why did he write this letter? Because his hands were tied in Pittsburgh, when he could not help me in

Pittsburgh as a Coast Guard officer. I will further state the reason why it can't be done.

I will just read you one paragraph of one letter that is so vital to us right now. This letter was to Colonel deMelker, United States Army Engineer District, Pittsburgh, June 25, 1962:

> "These waste oils and flammable products that were saturating our shores last week and the week before where barges of flammable products are moored could cause an explosion that could wipe out half of Pittsburgh and people by thousands could be burnt and mutilated. These conditions will become even more hazardous due to welders repairing barges in the same landings at the time barges are being cleaned. This one landing is not named because worse conditions might be apparent in other landings of which I am not familiar and have not looked into in the past five years."

Are we safe right now in the Hilton Hotel from one of these explosions? Do you want to hear their answer?

"U.S. Army Engineer District, Pittsburgh
Corps of Engineers
June 29, 1962

E. Thayer

"Receipt is acknowledged of your letter dated 26 June 1962 in regards to pollution of the rivers in the Pittsburgh area.

"Your interest in this matter is appreciated.

"Sincerely yours,

J. P. Dore

Assistant Chief, Operations Division

Now, the Ohio River Valley Water Sanitation Commission, July 2, 1962:

"This will acknowledge copy of your letter to Colonel de Melker, Pittsburgh District Engineer, U. S. Army Corps of Engineers, relating to the discharge of refuse and of oil in the Ohio, Allegheny and Monongahela rivers.

"Discharges of refuse into navigable waters are in violation of Title 33, United States Code, Section 407, the administration and enforcement of which is within the jurisdiction of the Department of the Army through its Office of the Chief of Engineers.

"I might also add the Section 411 of Title 33 provides a penalty for violation 'by a fine not exceeding $2,500 nor less than $500,' or by imprisonment for not less than thirty days nor more than one "year, or by both such fine and imprisonment and 'in the discretion of the court, one-half of said fine to be paid to the person or persons giving information which shall lead to conviction.'

"A representative of the U. S. Corps of Engineers, Mr. Edwin E. Abbott, serves as a member of the Ohio River Valley Water Sanitation Commission. I am sending Commissioner Abbott a copy of this note and your letter so that he may be informed of the conditions to which you refer.

"With regard to oil discharged from vessels and shore installations in the Ohio Valley district, such pollution is in violation of Resolution No. 20-58, Oil Control Measure, adopted September 12, 1958 by our eight-state commission. I am sending a copy of your note setting forth alleged violations to Dr. Charles L. Wilbar, Jr., past chairman of our Commission and chairman of the Pennsylvania Sanitary Water Board.

"I know that Dr. Wilbar will want to look into this matter not only from the viewpoint of his Pennsylvania board but also from the standpoint of interstate pollution implications.

"On behalf of Commissioners Abbott and Wilbar,

> "I thank you for writing so that they can lend their efforts to improvement of pollution control.
>
> "Very truly yours,
>
> /s/ Edward J. Cleary"

There are Mr. Abbott, Mr. Wilbar, Mr. Wright and a Mr. Weakley on that one.

This is to Mr. Joseph P. Smurda, and I will read just one paragraph:

> "To be frank about it, I have found by experience that my individual complaints over more than five years to the authorities fell on deaf ears until I went to the newspapers and radio and TV, and that there has been more progress in the last few months since I resorted to these groups than in years before. I certainly intend to ask for their support again, unless I am given some assurance that Saw Mill Run will be cleaned up immediately; and unless these promises are backed up by prompt action."

I have photographic evidence of what can be done, if you are interested, but you must have interested personnel in these departments. You can't do anything unless you do have.

My display out front will show that this can be done. Is it not clear that we can have an explosion, yes, today, that can tear up half of Pittsburgh, where we have millions invested in it?

You are trying to keep this stuff off of the floor?

What's wrong with this conference? Here is photographic evidence right here of what can be done after a TV broadcast. Look out on the boards. It will prove to you what will happen. You can swim in the Ohio River after a TV broadcast about these steel mills, what they are doing. If I jump in a boat and go up the Monongahela River with a TV camera, immediately that stream will become clean. It will do that for two weeks.

If we can do it for two weeks, why didn't we have it indefinitely, and why does a citizen have to get up here on TV and waste his valuable time trying to get something done that is supposed to be done by the authorities?

What's happening? How can anyone avoid answering questions like that, where Pittsburgh can be blown off the map by a barge? Photographic evidence out there of oil all around those barges. I have seen it clear around the barges right out here.

What happens? Nothing happens. It didn't blow is the reason nothing happens. Do we have to wait for something like what happened out in California before we get the authorities to do something?

As photographic evidence, a man tears this piece (indicating) off of his boat, off of a new Chris-Craft, fiber glass off a new Chris-Craft boat to bring in here, and you don't want this evidence in here?

I thank you, gentlemen.

MR. STEIN: Thank you very much.

Are there any comments or questions?

(No response.)

MR. STEIN: If not, thank you.

MR. THAYER: I have many of them that I can answer, backed up by photographic evidence of all over the whole State, including West Virginia too.

I will support your view if you will take it over.

MR. STEIN: Thank you for your contribution to the conference.

If there is nothing else, we want to thank you again for a very productive conference, and we stand adjourned.

(Whereupon, at 1:25 p.m., the conference was adjourned.)